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Asset Management and Facility Equipment Maintenance Nexus: Maintenance Effectiveness

Stuart D. Foltz, Carlos B. Bislip-Morales, and
E. Allen Hammack

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Asset Management and Facility Equipment Maintenance Nexus: Maintenance Effectiveness

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Abstract

The US Army Corps of Engineers (USACE) has constructed a wide variety of civil works structures. Many of these structures have surpassed their design life and deteriorated to a point that better tools and more extensive analysis are needed to identify the most critical maintenance and repair (M&R) needs. The work documented in this report analyzes how data collected in Facility Equipment Maintenance (FEM) can be used to evaluate the effectiveness of maintenance to improve the condition of lock infrastructure components. This includes analyzing how data already being collected in FEM can be used to evaluate maintenance effectiveness and also what additional data could be collected. In the process of addressing these objectives, numerous limitations in how FEM and Operational Condition Assessment (OCA) could be used to address this question were discovered, and they are documented in this report. The report also discusses numerous ways FEM could be used more effectively to address this question and the general benefit of USACE. A pilot Maintenance Effectiveness Review (MER) was held at a USACE lock and dam project.

Executive Summary

The authors of this report were given approximately five calendar months to investigate USACE data pertaining to how maintenance affects the condition of navigation infrastructure. The focus was intended to be on a comparison of maintenance, based on records in FEM, and condition, using the Operational Condition Assessment (OCA) ratings. The scope of this basic question is immense.

Further instruction narrowed the scope for this initial study to five more specific concerns:

1. Examine OCA Inland Navigation data and FEM database for correlation of assets/components.
2. Develop and test data queries of those correlated assets/components as needed for differing USACE locations—most likely Portland (NWP), Great Lakes and Ohio River (LRD), Mississippi Valley (MVD), and North Atlantic (NAD).
3. Using queries from step #2, pull maintenance data from FEM that relates to a condition rating in the Inland Navigation OCA.
4. Examine the data subset from step #3 for certain fields that would likely correspond to condition: failure data, installation date, and frequency of Preventive or Corrective Maintenance (PM or CM).
5. At some point, question subject matter experts (SMEs–perhaps external to USACE) to learn what other data fields may correspond to condition that could be queried under step #4.

Work was initiated, but difficulties arose almost immediately:

- FEM has no universal list of components or naming conventions. There are standardized classifications available for use, but they are for assets at a relatively high level of the infrastructure hierarchy.
- Many different types of maintenance are applied to various components and subcomponents of these classified items. OCA ratings are also for components and subcomponents of these classified items.

- Each USACE Division, District, and project is left to determine independently what they want to list in FEM as assets and how they name each one.
- As for OCA, multiple lists of OCA components were obtained, and at least two different lists had someone defend it as the correct and complete list.
- Because there is no uniform identification of assets within FEM, it was not possible to develop queries by using them.
- Additionally, there was little or no maintenance data for FEM assets that could be meaningfully queried. What is available primarily consists of job plans, of varying detail, clarity, and accuracy. The job plans are implemented based on a preventative maintenance schedule, and completion is recorded when applicable.

Some job plans were reviewed, and this review is discussed further in Chapter 2. FEM includes some data fields which might provide a more accurate picture of maintenance effectiveness, but current usage of these data fields is too limited for making meaningful queries. Two comprehensive approaches to analyze maintenance effectiveness are addressed in Sections 4.1 and 4.3. One approach is to use failure rates of each specific grouping of components as an indicator of maintenance effectiveness. The second method is to look at the ratio of routine to non-routine maintenance. Each approach has its strengths and weaknesses. A number of more targeted approaches are proposed in 4.4.

Whether maintenance management information of various types is currently being entered into FEM, could be entered but is not, or can't currently be recorded in FEM, there still needs to be a well-developed plan for how this information is going to be used, how it will benefit the Corps, how to ensure it is entered, and how it will be reviewed for accuracy.

Only a small part of FEM's capabilities are being used now, and there is much more that could be done with minimal or no additional effort to benefit the project directly and to provide more information for understanding USACE maintenance practices.

The following items currently in FEM should be reviewed and revised by the asset owners:

- Job plans

- Asset hierarchies
- Classifications

The following items can currently be entered in FEM, but generally are not entered. There should be additional guidance to increase uniformity within and across projects:

- Labor
- Materials and costs
- Inventory

The following are items that can be entered in FEM but some have no standardized input to ensure uniformity. They should be reviewed and revised at the national level. There is a need to not only ensure uniformity and consistency, but also to determine what data will best meet needs at local and national levels:

- Classifications
- Attributes
- Failure reporting
- Downtime reporting
- Condition monitoring
- Asset prioritization
- Work order prioritization

A Maintenance Effectiveness Review (MER) was held at New Cumberland Lock and Dam. Because USACE is not applying maintenance according to uniform standards throughout its inventory, nor is it collecting the types of maintenance data that might be used to make estimates of reliability (as would be typical for an organization with a mature maintenance management program), the MER had a somewhat different focus than it might otherwise have had.

The primary activity was to review and improve the text of the job plans. Prioritization capabilities within FEM were also reviewed, and an attempt was made to apply them to assets and job plans. Many useful results came out of the MER. For example, the authors gained a much better understanding of the operation of a navigation lock and the maintenance that is performed. However, some unforeseen issues greatly affecting the mainte-

nance practices and priorities of the lock personnel were discovered. These include:

- An expectation of never being able to replace items deemed non-critical or only being able to with expenditure of excessive time justifying, purchasing, and (as applicable) installing. This results in what may be an excessive effort to avoid the breakdown, failure, or wear-out of any piece of equipment regardless of cost-effectiveness of these maintenance actions.
- The sense of ownership, responsibility, and pride in the project held by the personnel. Clearly there is value to USACE in supporting that desire of the maintenance staff to make the project the best they can.
- A risk-aversion to making changes from the standard operating procedure due to no expectation of reward if it works and an expectation of punishment if it doesn't.

The results of the MER led to questions regarding the relationship between tasks in a MER and in the AM Maintenance Management Implementation Plan (MMIP) being piloted in each USACE division. A pilot implementation was attended by this study's authors, and it appears that the relationship between these two activities is mostly synergistic, with little or no overlap. At this time, however, details of the MMIP are not completely understood due to the pending release of some draft reports. It also appears that the MMIP objective of identifying project maintenance needs is being accomplished generically for the types of infrastructure present at the project rather than for the specific components and operational environment. By contrast, the process completed during the pilot MER for this work focused on the specific components and operational environment at that project.

Each approach has its benefits and drawbacks. Application of the same generic maintenance cost model to all projects within the MMIP does not properly account for specific circumstances at each project. If the model estimates are very good, the model will be generally correct on a network level. It will not, however, properly reflect the maintenance needs at any one project accurately. The focus on job plans and tasks done within the MER captures exactly what the local experts think needs to be done, but it does not account for varying expectations from project to project and does not align maintenance needs equitably across the network. See Uzarski

(2009) for further discussion of network and project-level application of maintenance management.

Using OCA rating data, a comparison was made between condition and age. The results suggest that there is minimal correlation between an asset's age and condition. This comparison is very preliminary, however, and not conclusive due to limitations of the data. These limitations include the use of a project service date rather than specific component ages and multiple reasons to be suspicious of the applicability of the OCA ratings. The primary reason for the suspicions regarding using OCA ratings is that most ratings were "B," but there also are concerns about what the OCA is rating (as described in the next paragraph).

At the start of this project, it was requested that OCA ratings be used as the measure of component condition. OCA ratings also are being used as one input for estimating user impacts. While no literature is known to verify the effectiveness for that objective, a review of the criteria for assigning these ratings suggests that OCA ratings do not provide a meaningful measure of condition as it would relate to maintenance. OCA ratings include numerous factors unrelated to maintenance (e.g., violates law, life safety concern, capacity, design flaw) and the measures of condition related to maintenance (e.g., normal wear) and potentially related to maintenance (e.g., imminent failure, recent service loss, known deficiency) not only are not continuous, but also the discrete ratings are based on yes/no measures that provide minimal information regarding deterioration or indication of maintenance effectiveness.

The primary objective of this project was not met. Early in the project it was learned that the maintenance records in FEM lacked the detail and specificity to complete the primary tasks. It was also determined that the OCA ratings did not capture appropriate information for assessing maintenance effectiveness. Nonetheless, this project resulted in many valuable findings that can be applied within USACE Civil Works O&M maintenance management to improve effectiveness.

One of the major findings was that a focus of prioritizing repairs based on risk of unscheduled outage results in conflicting priorities with standard maintenance management practices focused on minimizing overall maintenance costs. This conflict likely reduces overall system condition. It is unlikely that maintenance can be optimized directly, based on the pri-

ority of individual work packages. Instead, it is reached by a properly balanced application of preventive and corrective maintenance.

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Preface

This study was conducted for Headquarters, US Army Corps of Engineers (USACE) under Project #371013, "Linking FEM and Asset Management." The technical monitor was William J. Lillycrop, Technical Director for Navigation.

The work was performed under the direction of the Materials and Structures Branch (CF-M) of the Facilities Division (CF), U.S. Army Engineer Research and Development Center – Construction Engineering Research Laboratory (ERDC-CERL). At the time of publication, Vicki VanBlaricum was Chief, CEERD-CF-M and Michael Golish was Chief, CEERD-CF. Martin J. Savoie was the Technical Director for Installations. The Deputy Director of ERDC-CERL was Dr. Kirankumar Topudurti, and the Director was Dr. Ilker Adiguzel.

COL Jeffrey R. Eckstein was the Commander of ERDC, and Dr. Jeffery P. Holland was the Director.

Abbreviations

Term	Spellout
AM	Asset Management
APPMS	Automated Personal Property Management System
CERL	Construction Engineering Research Laboratory
CM	corrective maintenance
CW	Civil Works
ERDC	Engineer Research and Development Center
FEM	Facility Equipment Maintenance
GUI	graphical user interface
HQ	headquarters
LRD	Great Lakes and Ohio River District
M&R	maintenance and repair
MER	Maintenance Effectiveness Review
MMIP	Maintenance Management Implementation Plan
MVD	Mississippi Valley District
NAD	North Atlantic District
NAVSEA	Naval Sea Systems Command
NWP	Portland District
OCA	Operational Condition Assessment
OMBIL	Operations and Maintenance Business Information Link
PM	preventive maintenance
REMIS	Real Estate Management Information System
SME	subject matter expert
SWH	standing work history
USACE	US Army Corps of Engineers

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miles (U.S. statute)	1,609.347	meters

1 Introduction

1.1 Background

The US Army Corps of Engineers (USACE) has constructed a wide variety of civil works structures. Many of these structures have surpassed their design life and deteriorated to a point that better tools and more extensive analysis is needed to identify the most critical maintenance and repair (M&R) needs. Asset Management (AM) is working to develop many of these capabilities. One concern is the impact of M&R on the condition and the reliability of the infrastructure. Maintenance is currently applied based on a combination of continuing maintenance practices that have been done in the past and repair decision making based on the expertise of the managers, engineers, and mechanics. In most cases this has resulted in facilities in good condition for their age but it provides limited capability to analyze past performance to determine what works best and how to improve.

1.2 Objective

The intended objective of the research project being documented in this report is to analyze how data collected in Facility Equipment Maintenance (FEM) can be used to evaluate the effectiveness of maintenance to improve the condition of lock infrastructure components. This includes analyzing how data already being collected in FEM can be used to evaluate maintenance effectiveness and also what data could be collected. The second part can be further broken down into data FEM is already designed to collect and data that FEM is not currently designed to collect.

Ideally, prioritization of M&R expenditures should be based on minimization of risk (event probabilities and event consequences). This requires an understanding of how infrastructure performs given the usage, environment, and maintenance histories and an ability to measure and quantify them independently to understand the role of each on reliability. This is a difficult and complicated question that this report only begins to address.

1.3 Approach

The focus of this research was intended to be on a comparison of maintenance based on records in FEM and condition using the Operational Con-

dition Assessment (OCA) ratings. Further instruction narrowed the scope for this initial study down to five more specific concerns:

1. Examine OCA Inland Navigation data and FEM database for correlation of assets/components.
2. Develop and test data queries of those correlated assets/components as needed at differing locations, most likely Portland District (NWP), Great Lakes and Ohio River District (LRD), Mississippi (MVD), and North Atlantic District (NAD).
3. Using those queries, pull maintenance data from FEM that relates to a condition rating in the Inland Navigation OCA.
4. Examine the data subset from step #3 for certain fields that we think correspond to condition: failure data, installation date, and frequency of Preventive or Corrective Maintenance (PM or CM).
5. At some point, question subject matter experts (SMEs–perhaps external to USACE) to learn what other data fields may correspond to condition that we could possibly query under step #4.

As work progressed, these tasks were modified and additional tasks were added. The biggest of the additional tasks was a review of the capabilities of FEM and completion of a pilot Maintenance Effectiveness Review (MER). Each of these tasks was useful in better understanding how FEM could be used to collect data on maintenance practices.

2 FEM Maintenance Data

2.1 Introduction

While FEM can collect various maintenance-related information and help manage day-to-day maintenance activities, it provides little or no programmed capabilities to analyze information or make statistical comparisons. That said, there are many benefits which can be gained through intelligent use of the tool. If these benefits are to be gained, however, the data must be entered using organization-wide, uniform methods that are specifically designed for the intended types of analyses.

Currently, most of the data that could be collected in FEM is not being collected, and much of the data that is entered uses free-text fields and other non-uniform methods that are not conducive to searches and statistical analysis. FEM currently includes data fields to collect some of this data more systematically. FEM could be set up to allow standardized collection of even more information that would be useful for analysis and optimization of maintenance practices. This chapter is only an introductory discussion of issues regarding the use of FEM.

2.2 Assets[1]

In FEM, assets are anything that work is managed against. Assets can be real property (facilities), personal property, or components. Components are defined as a part or feature of an asset (or another component) that will be maintained, repaired, or replaced. For example, a roof, exterior building envelope, and HVAC system can be components of a building (real property) asset, a fan can be a component of an HVAC system (another component of an asset), and an engine can be a component of a backhoe (personal property) asset.

FEM is an asset-based work management system in which every work order must be associated with an asset. Although FEM will allow work orders to be written against locations, this is not a good business practice since work activities and their associated costs should be connected to an

[1] Portions of this section were provided by John Beshears at USACE Walla Walla District (NWW).

asset. Typically, FEM users attach their work orders to assets, but there is no USACE policy on how work orders are managed. Furthermore, inconsistencies in the levels of asset hierarchy that are chosen can make analysis of maintenance practices more difficult.

FEM provides numerous ways to organize assets and their components. The FEM *Locations* module provides an organizational umbrella for assets. Although you can create an asset without a location, it is not recommended. Locations provide a macro-level organization of assets. The module allows users to assign "parent-child" relationships to locations, and the relationships created can be used to organize locations and their associated assets into functional or geographical *hierarchies*. The most common type of location hierarchy is geographical. An example is shown in Table 1).

Table 1. Geographical location hierarchy.

Pine Flat Project Top Level
Dam and Restricted Area
Headquarters Area
North Lake Area
Deer Creek Recreation Area
Island Park Recreation Area
Trimmer Recreation Area
Sycamore Creek WMA
East Lake Area
Kirch Flat Campground

The FEM *Asset* module also allows users to assign parent-child relationships to assets, and those relationships can be used to organize assets into functional or geographical *hierarchies*. Both functional and geographical hierarchies of assets can be incorporated into the overall asset organizational scheme. Hierarchies allow a manager to organize an asset inventory in a way that makes sense and is easily accessible. A well-designed hierarchy matches the way the users think about and manage assets in the hierarchy. A sample functional asset hierarchy is shown in Table 2.

Table 2. Functional asset hierarchy.

Visitor Center
- *HVAC*
  - Furnace/Forced Air Unit
  - Air Conditioner Compressor
  - Air Conditioner Evaporator
- *Plumbing*
  - Piping (hot & cold water)
  - Water Heater
  - Fixtures
- *Exterior Envelope*
  - Siding
  - Paint
  - Windows
  - Doors
  - Roof

Note that a list of assets within a FEM site should be referred to as an *asset inventory*. The parent-child relationships of the assets within the asset inventory are known as the *asset hierarchy*. Sometimes you will hear the term "hierarchy" mistakenly used in the context of the term "inventory;" it is important to remember that the terms do not mean the same thing.

Asset inventories and their associated hierarchies can be relatively simple or extremely complex, depending on the importance and/or criticality of the asset and the level of maintenance management it requires. As an example, the asset/component hierarchy of a recreational site located at a multipurpose project might only include the top-level asset, "recreational facility" and its associated buildings, while the asset/component hierarchy of a hydroelectric turbine and generator may contain hundreds or even thousands of components. The OCA process may eventually be used in the FEM asset inventory/hierarchy for some assets such as locks where the goal is to have a one-to-one match between the OCA model and the FEM inventory/hierarchy. This one-to-one match does not currently exist. (See Section 2.5 for further details.)

The development of FEM asset inventories and their associated hierarchies should be a joint effort between the project's management staff and the project's maintenance and operations staff, with input from the USACE district. Some districts require specific smart-numbering systems,

or they may require a standard inventory and hierarchy be created to a certain level. Project maps, printouts from REMIS (Real Estate Management Information System) and APPMS Automated Personal Property Management System), organization charts, and other project information should be available for reference during the process. Users should consider tools like OCA, RecBest, and others when developing their inventories.

The development of a good location list and hierarchy plus a well-thought-out, top-level asset inventory/hierarchy will facilitate easy future expansion and revision.

2.3 Asset classification[2]

Asset *classifications* are a function of FEM/Maximo[3] that allows the development of an asset taxonomy. The FEM classification screen is shown in Figure 1. A precise taxonomy of assets allows searching the database across the enterprise without regard to asset numbering and naming schemes or asset hierarchies. Classifications are a very powerful tool for identifying assets within an enterprise database like FEM; they are critical to statistical analysis of maintenance effectiveness.

Imagine that the Corps decided to track all pickup trucks in FEM, and HQ made a call to the field to ensure every pickup truck was included in a FEM asset inventory/hierarchy. Once the field complied, however, all this data would be of little value on either a division or national level because some people might use "PU," some might use "P/U" while others might even use model names such as "F-150" and "Silverado" to describe their pickup truck assets instead of the word "pickup." Some people might suggest that a universal asset numbering system adequately identifying pickups would solve this issue, but there could still be transposed characters and other problems due to human error. The best way to solve the problem is to direct the field to select the asset classification, "20-02-07, Trucks, Pickup, Group F" for each pickup truck asset of this type. Selecting the classification in this way (from a predetermined pull-down list) ensures there is no chance of misspelling or transposing characters. Now it is easy to search all pickup data across the entire database.

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[2] Portions of this section were provided by John Beshears at USACE Walla Walla District (NWW)

[3] Maximo is a commercially available software program that USACE had customized and this customization resulted in FEM.

The current system of asset classifications in FEM is based on ER 37-1-30, "Financial Administration - Accounting and Reporting," which contains an appendix "Authorized Purposes for Multi Purpose Hydropower Projects" (USACE 2002). The classification structure and classified lock components are reproduced in this report as Appendix A: FEM Component Classifications. The current classification system is appropriate for classifying real property facilities and major items of personal property, but it includes only higher levels of detail for component hierarchy (Figure 1). The more detailed classification options for locks are shown in Figure 2.

Where the current system *does* address components at a somewhat lower level, such as an elevator, the system exhibits some problem areas with singularity. Ultimately, the Corps will likely expand classifications to the component level by using UNIFORMAT II, Unified Facilities Guide Specifications (UFGS), OCA, or other input as an organizational guide. In the interim, users are advised to classify their assets in accordance with any guidance offered by each USACE business line.

Figure 1. FEM asset classification page with little component detail.

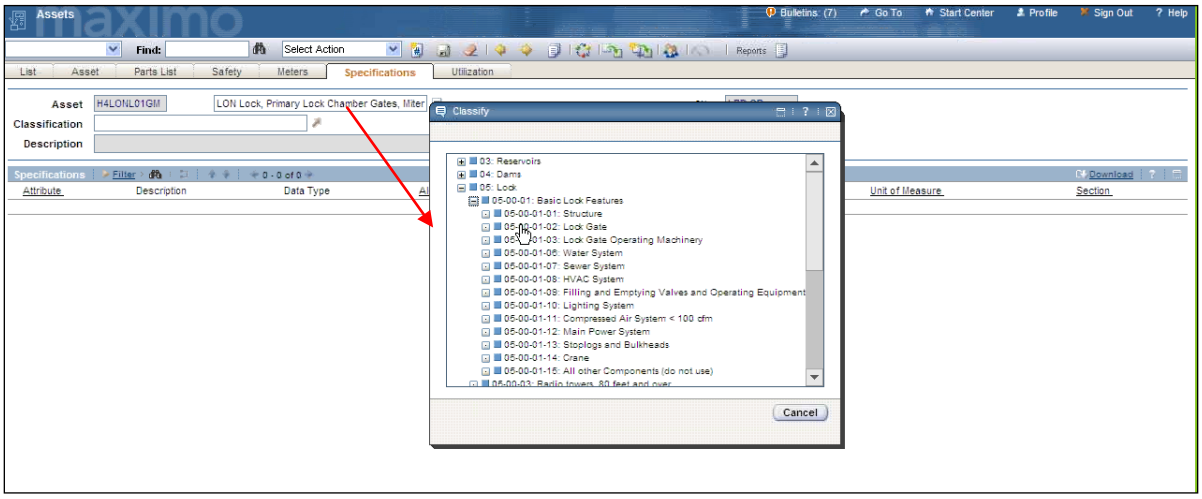
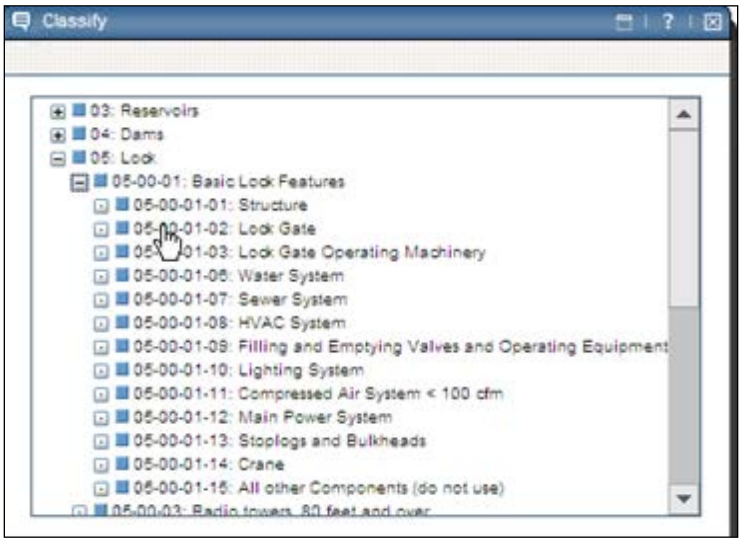


Figure 2. FEM's navigation lock asset classification, showing additional classification detail.



2.4 Attributes

Once a classification is established in FEM, the program supports a list of *attributes* associated with a particular classification. Attributes provide additional information about the asset related to its classification. In the previous pickup truck example (Section 2.3), some of the attributes established are engine size, number of cylinders, air conditioning (yes/no), color, etc. Currently, attributes have been developed in FEM for floating plant and some vehicular classification. The hydropower business line is in the process of identifying attributes, and attributes are also being developed to help support dredged material disposal area management. Determining what attribute information should be collected and then collecting this data is critical to tracking maintenance effectiveness and being able to retrieve meaningful information for particular assets. Attributes and classifications are critical for sorting infrastructure assets for many types of analysis, including maintenance effectiveness.

2.5 Comparison of OCA critical components to FEM assets at individual locks

In order to evaluate how well the FEM database entries have been populated by project personnel, the existing FEM hierarchies were compared to those in the AM OCA ratings database. By analyzing the FEM hierarchies of multiple projects from different USACE districts, an understanding of how infrastructure components are currently identified in FEM throughout USACE can be inferred. The goal of the comparisons is to determine

how closely the FEM hierarchical components correspond to the OCA components. The OCA component list should include all the vital components of a navigation project. Therefore, all components listed in the FEM hierarchies should also be listed in the OCA database. By comparing the OCA and FEM databases, the FEM database can be evaluated for completeness.

Three navigation projects were chosen for the OCA/FEM database comparison:

- Wilson Lock and Dam (Nashville District)
- Lower Monumental Lock and Dam (Walla Walla District)
- Lock and Dam No. 14 (Rock Island District)

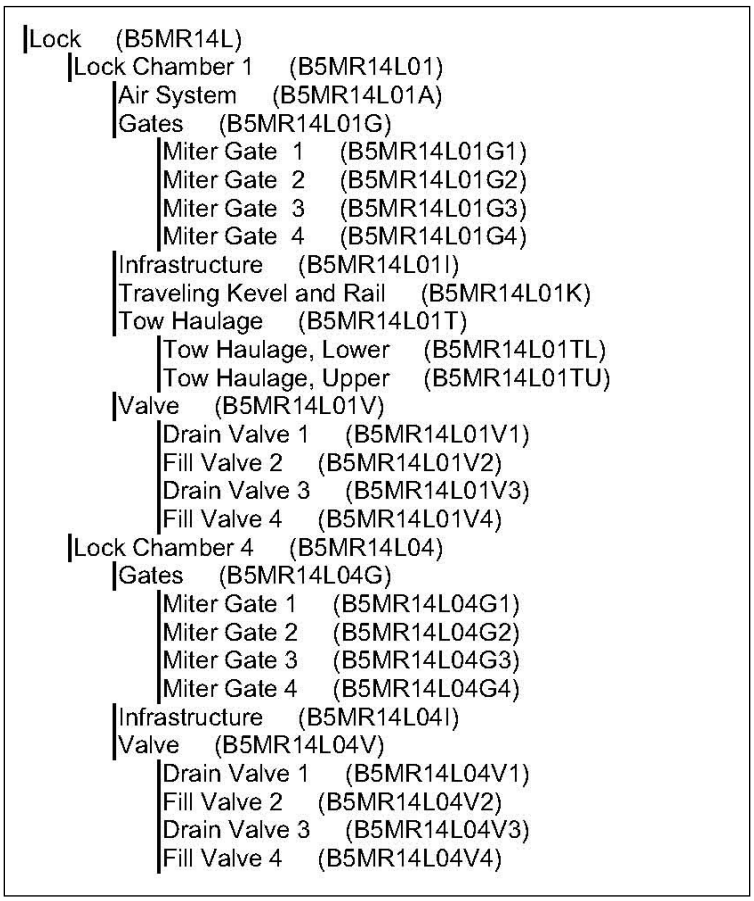
Results of the comparison showed the level of detail in the FEM database varied greatly among these three projects. For both Wilson Lock and Dam and Lower Monumental Lock and Dam, a sufficient amount of detail was included in the database for comparison with the OCA component list. The listed components ranged from lock gates and lock culvert valves to elevators, lighting, and fence lines. (For reference, the FEM hierarchies for Wilson Lock and Lower Monumental Lock used in the OCA/FEM comparisons are listed in Appendix B: FEM Component Hierarchy Examples.) By contrast, for Lock and Dam No. 14, the level of detail within the FEM database was much lower. Only the largest navigation lock components, such as the gates were included (see Figure 3). A section of the OCA/FEM comparison for Wilson Lock is shown in Table 3. (For reference, the complete OCA/FEM comparisons for Wilson Lock and Dam and for Lower Monumental Lock and Dam are in Appendix C: OCA and FEM Component Comparisons).

In Table 3, the second column is very sparse for multiple reasons. First, the OCA component list includes many types of components not present at these locks. The lock also has infrastructure not deemed critical by OCA, so it is not listed as an OCA component. These reasons are acceptable. The problem stems from much of the infrastructure at the locks not being identified in the same way in both the FEM and OCA component lists.

Table 3. Partial OCA/FEM comparison for Wilson Lock.

OCA Component List	FEM Hierarchy
1. Lock	Structures
2. Lock Structure	Primary Chamber
3. Lock Walls & Other Lock Structures	Lock Walls
4. Landside Wall	Land Wall
5. Stability	
5. Structural	
5. Deterioration	
4. Middle/Intermediate Wall	
5. Stability	
5. Structural	
5. Deterioration	
4. Riverside Wall	River Wall
5. Stability	
5. Structural	
5. Deterioration	
4. Guide Wall	Lower Guide Wall
5. Stability	
5. Structural	
5. Deterioration	
4. Guard Wall	Upper Guide Wall
5. Stability	
5. Structural	
5. Deterioration	
4. Pier Wall	
5. Stability	
5. Deterioration	
4. Nose Pier	
5. Stability	
5. Structural	
5. Deterioration	
4. Gate Sill	Guard Sill, Downstream Guard Sill, Upstream Miter Sill, Downstream Miter Sill, Upstream

Figure 3. Lock & Dam No. 14, complete FEM hierarchy.



The FEM hierarchy for Wilson Lock contained a major component – an air bubbler system – that was not included in the OCA database. Such an omission is a concern, and the OCA database should be evaluated to determine if any other components are also missing.

Inspection of the FEM hierarchies revealed that the terminology used to describe lock components varies among navigation projects. For instance, a component may be referred to as a "culvert valve" at one project but as a "reverse tainter gate" at another project. While neither description is technically incorrect, the difference in description (and level of detail) significantly hinders efforts to compare the components at different projects. Implementing a project component naming convention would greatly reduce the problems associated with the level of detail in component descriptions within the FEM database.

Another common problem found in the FEM database entries was widespread typographical and spelling mistakes. These seemingly minor errors

cause significant problems with automated searches of the database. Such problems can be avoided by limiting data entry in the FEM database to existing component lists. These component lists would be generated for all USACE projects to create an all-inclusive list of components (to a certain level of detail) at all projects. For instance, when creating an entry in the FEM database for the upstream miter gate at a lock, the data entry employee would not have to manually type "miter gate," but would just have to select "miter gate" from a pull-down list in the FEM database.

2.6 Job plans

FEM job plans record details for a particular maintenance activity that can be repeated on a routine or non-routine basis. Most job plans are for routine activities, but a non-routine job plan is a good way to document how to complete a recurring non-routine activity. This documentation might be especially important for a complicated job with difficult-to-remember steps or a job with critical safety concerns. Job plans primarily consist of tasks, labor (including crafts and crews), materials (including inventory), tools, and remarks.

2.6.1 Job plan tasks

Well-written, detailed, job plan tasks provide an important record of what maintenance is planned. While there are other ways that completed maintenance can be recorded in FEM, a record of completed job plan tasks is best. High-quality job plan task descriptions also allow comparisons from project to project, and they are especially useful to maintenance personnel new to the project. See Table 4 for an example of a job plan with tasks, after it was edited during the MER. Job plans for Bayou Sorrel, Lower Monumental, and New Cumberland are provided in Appendix D: FEM Job Plans. These examples illustrate the range of detail for job plans typical within USACE.

Most projects include minimal detail for routine maintenance tasks within FEM. The reasons for this lack of detail include those listed below.

- Initial job plans were primarily cut and pasted from maintenance manuals.
- Tasks were copied to remarks field instead of to separate task fields.
- Personnel haven't had time to update and edit their job plans.
- Personnel "know" what needs to be done.

- Some of the specifics are documented elsewhere.
- Almost certainly for various other reasons, good and bad.

Table 4. Example job plan.

ASSET: H4LONL - LON Lock
PM: H4LON8465 **DESCRIPTION:** Rack & Sector Gears, Operating Levers, Rollers & Guides-Q
JOB: H4LON25323 **CREW:** H4LON-MC
FREQUENCY: 3 months

Elapsed Time: 16 hr **Total Manhours:** 32 m/h
Personnel: 2 mc

Task Description: Lubricate 1200-ft and 600-ft Chamber Miter Gates Rack & Sector Gears, Operating Levers, Rollers & Guides

1. Review AHA for this procedure.
2. Review MSDS for precautions with grease and solvents used in this procedure.
3. Gather tools required to complete maintenance.
4. Ensure all personnel informed of activity.
5. Remove grating to access machinery.
6. Inspect and lubricate rollers and guides with 630AA.
7. Inspect and lubricate rack and sector gears with MPG 2.
8. Inspect and lubricate operating levers and linkage assemblies with MPG 2.
9. Visually check anchorage for cracks and overall condition.
10. Operate miter gates to ensure proper operation and distribution of lubrication.
11. Check all components for looseness, wear and proper operation and adequate lubrication.
12. Listen for abnormal noises coming from machinery.
13. Restore equipment to readiness condition.
14. Report completion in FEM.

Safety Precautions: Follow EM-385-1-1 general safety precautions when performing maintenance. Follow all posted safety precautions in the area of operation.

Tools, Parts, Consumables: 630AA lubricant, MPG-2 lubricant, Grating hooks, air compressor, air compressor, grease guns, putty knife, rags, buckets, absorbent wipes.

Remarks: This job is done more frequently at many other locks – perhaps they can reduce the frequency.

2.6.2 Labor, materials, tools, and remarks

Estimates of the required labor, materials, and tools can be entered in the job plan. This information not only helps in preparation for a particular work order (application of a job order according to a PM record) but also, the plans can also be used to compare available resources over a time period (e.g., month, year) to the resources at hand. Unfortunately, the "Remarks" field often becomes a catch-all for information that could be entered in other fields intended for that particular information.

2.7 Preventative maintenance records

PM records can include one or more job plans on the same or different schedules. When multiple job plans are included, it is often done to apply light maintenance on a frequent schedule (e.g., monthly) and heavier maintenance on a less frequent basis (e.g., annually).

2.8 Inventory

Materials and tools can be inventoried so that when a work order is generated, a request for these items can be placed and availability verified. (The benefits of this capability are outside the scope of this report.)

2.9 Job plan relevance to operation and condition

The relationship between a job plan and a component's operation varies depending on the component and the type of maintenance within the job plan. It is unlikely that any amount of data would allow a meaningful statistical evaluation of the maintenance benefit without a consideration of how the maintenance impacts the infrastructure. For example, lubrication of components can have one or more benefits of varying types:

- The component can break or freeze.
- Wear of the component can increase, shortening its life.
- Load on other components can increase, causing those components to break.
- Wear of the other components can increase, shortening their life.
- Performance of the component can be reduced, slowing lock operations or requiring additional manual labor to keep operations moving.

The above list of benefits may be imperfect or incomplete, but it should be clear that maintenance effectiveness is not as simple as comparing a job

plan's maintenance tasks to the condition of the applicable component. This lack of direct comparison is further complicated by job plans that apply various maintenance to multiple components and by components that have multiple maintenance actions applied to them, so that there is no one-to-one correlation between a job plan and a component's condition.

2.10 Work orders

Work orders can be automatically generated based on job plans and a PM record, or they can be generated manually. Manually generated work orders might be for an operational failure or to initiate further investigation of a concern. Work orders can be reported as completed, and many projects do this. As previously mentioned, job plan tasks can also be reported as completed. This is not typically part of the current USACE business practice, however. Reporting work order (and job plan tasks) completion is useful from a day-to-day operational standpoint, but it provides only a bare minimum of useful information for more rigorous analysis of maintenance practices. Labor reporting is very useful for numerous reasons, as discussed in Section 2.11. Recording of other maintenance results such as use of consumables, repair parts, and costs provides valuable information for analyzing maintenance practices. Recording such details is the best method for understanding how maintenance funds are used and the total cost for maintenance.

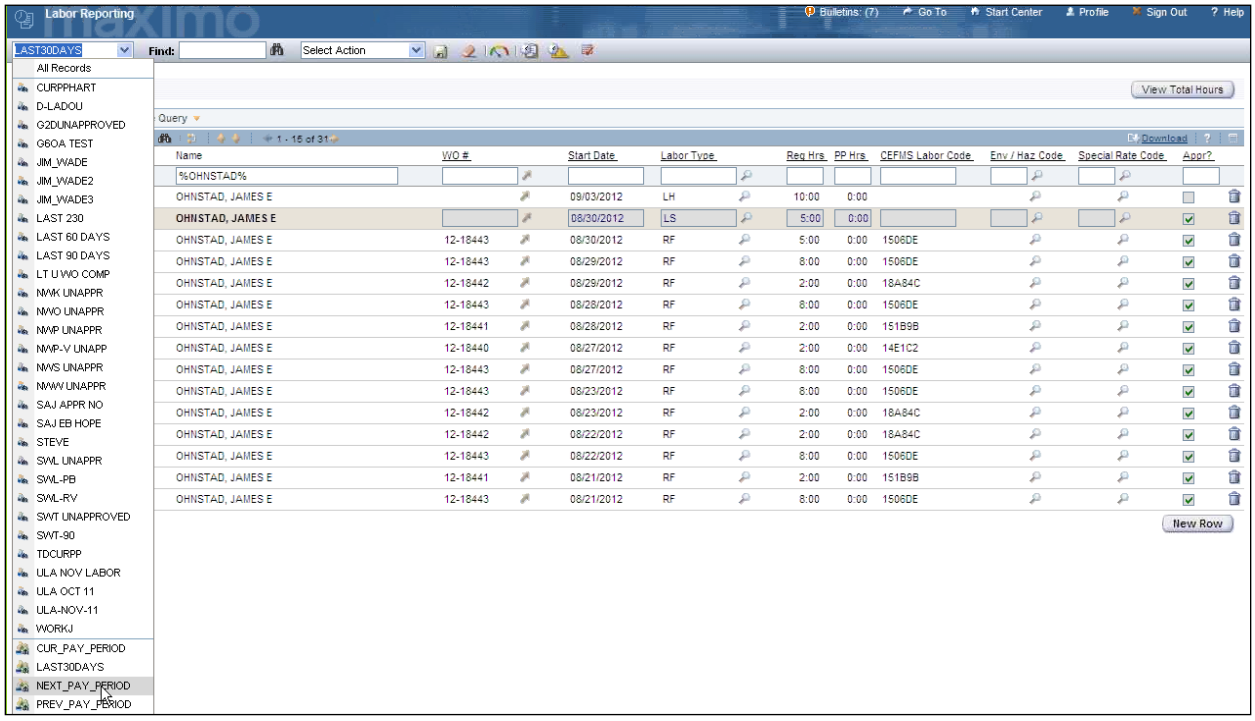
2.11 Labor reporting

FEM is configured to record labor information (Figure 4). In Figure 4, the frame is set up to include the person, hours, dates, work order, CEFMS work unit, and additional information. FEM labor reporting can be modified as needed.

As of this writing, there are two USACE districts recording labor in FEM and using this information in their payroll process. Many other districts are waiting for FEM and CEFMS to be linked before they use FEM to record labor. While efficiencies will be gained when FEM and CEFMS labor is linked, there are numerous reasons to consider recording labor in FEM now. First, the level of effort is similar to filling out a timesheet, something that has to be done regardless. There are also many advantages. It creates a record of how much time is actually spent on each work order. This allows comparison of the job plan estimates to the actual hours and is critical for determining the total cost of maintenance. Additionally, job plans

can be updated to show a more accurate estimate, anomalies in the time it takes to complete a job order can be investigated to better understand the maintenance requirements, time spent in non-maintenance activities (e.g., training) can be tracked, and costs for routine and non-routine maintenance can be compared. While this list of advantages is not exhaustive, it indicates significant value from tracking labor in FEM.

Figure 4. FEM labor reporting example.



2.12 Failure reporting

Failure reporting is important for a number of reasons but it basically comes down to understanding what fails, how often, why, in what conditions, and with what consequences. FEM includes a work order page for recording the failure class, problem, cause, and remedy (Figure 5).

At first glance, failure reporting seems to be quite simple. It is not. Each of the questions in the previous paragraph needs to be approached in a direct and explicit fashion to capture the desired information.

What has failed? — Identifying what has failed must be done in a consistent way. That means using classifications to identify the component and attributes to identify details such as the manufacturer, size, etc.

How often? — This is the best basis for estimating failure rates. It may also help identify systemic problems. The occurrence of a failure needs to be precisely defined. Is it based on a repair, subcomponent replacement, overhaul, total replacement, another basis, or some combination of these? The answer will determine how the data can be used.

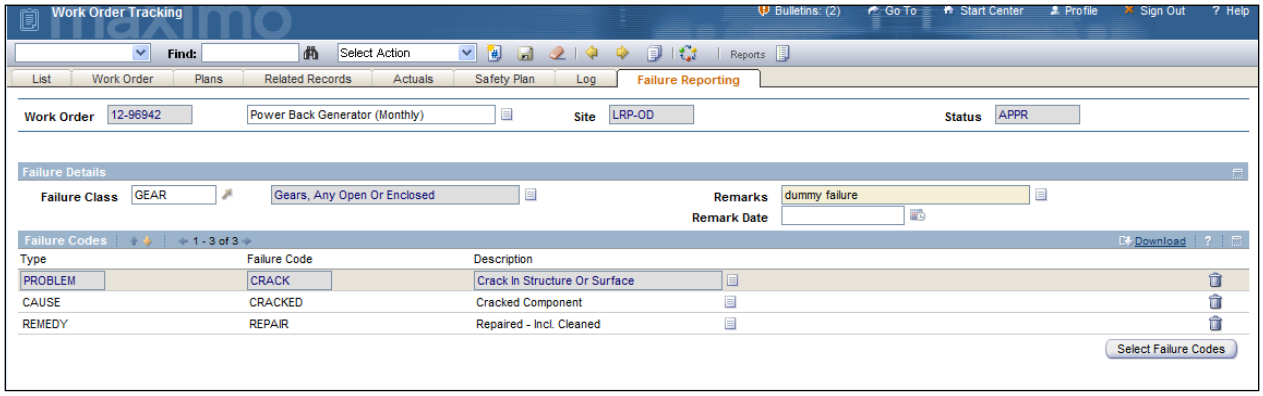
Why? — The most valuable data is identification of the failure mode. It makes a difference whether electric motor failures are from bearings that have been inadequately lubricated or from a short in the motor windings that can't be maintained but might indicate a manufacturer defect.

What conditions? — If every USACE lock were constructed with a similar design, size, usage, operating environment, etc., determining failure rates could be done more accurately. There are a number of ways to capture these operating conditions but it will require extensive forethought to most effectively account for these variables.

Suspensions? — How are replacements before failure to be recorded?

What consequences? – Should a failure be reported based on a stall, stoppage, non-routine application of maintenance, or other criteria?

Figure 5. Example of FEM failure report.



With adequate data points and detail, failure data can assist in many ways. First, it can allow a statistical calculation of past failure rates. This is important for verifying estimates used in risk analysis. Failure data can also help identify common causes of failures, maintenance deficiencies, manufacturing defects, design flaws, and other system faults.

While failure data information is useful, it likely needs to be supplemented with additional information. Useful supplementation includes (a) information that can be collected in FEM such as age; (b) information that should be collected as standardized attributes such as the manufacturer, model, size, etc.; and (c) information such as condition as it relates to the specific failure mode. While this last piece of information (condition) could be accomplished by extensive data collection, there are possible alternatives such as post-failure estimates and automated condition monitoring.

2.13 Downtime reporting

Currently, FEM makes no direct connection between downtime reporting and failure reporting, although both must be tied to a work order. Downtime reporting differs from failure reporting in that it is primarily concerned with recording what asset is unavailable and the duration. Figure 6 and Figure 7 show entry of this information into FEM. Note that downtime reporting is based on what is occurring during the downtime and does not include information on what led to the downtime. It also does not specifically distinguish between scheduled and unscheduled downtime. Currently there are five choices for types of downtime, as shown in Figure 7. Note that the list does not include any type of weather-related downtime, nor does it allow recording a boat accident, personnel injury, or other causes not listed in FEM. Although it is possible to record lock stoppages and shutdowns within the downtime reporting, there is no obvious best way to do that and currently no guidance on how it should be done. As a result, if a project started using FEM to record shutdowns, it is likely those shutdowns would be recorded in different ways across USACE and thus, would not allow easy compilation of the history of shutdowns and their causes.

While there is no direct link in FEM between downtime reporting and failure reporting, because both are tied to a work order, a link is established, and both can be matched up within the database. But that link is weak within the user interface because failure reporting is located on a work order tab and downtime reporting is on a pull-down menu. It would be better if the user interface included a stronger link between the two. One option that would be a rather weak but useful link is to prompt the user to enter a downtime report when exiting failure reporting and provide a similar prompt when exiting the downtime report.

Figure 6. FEM downtime reporting selection.

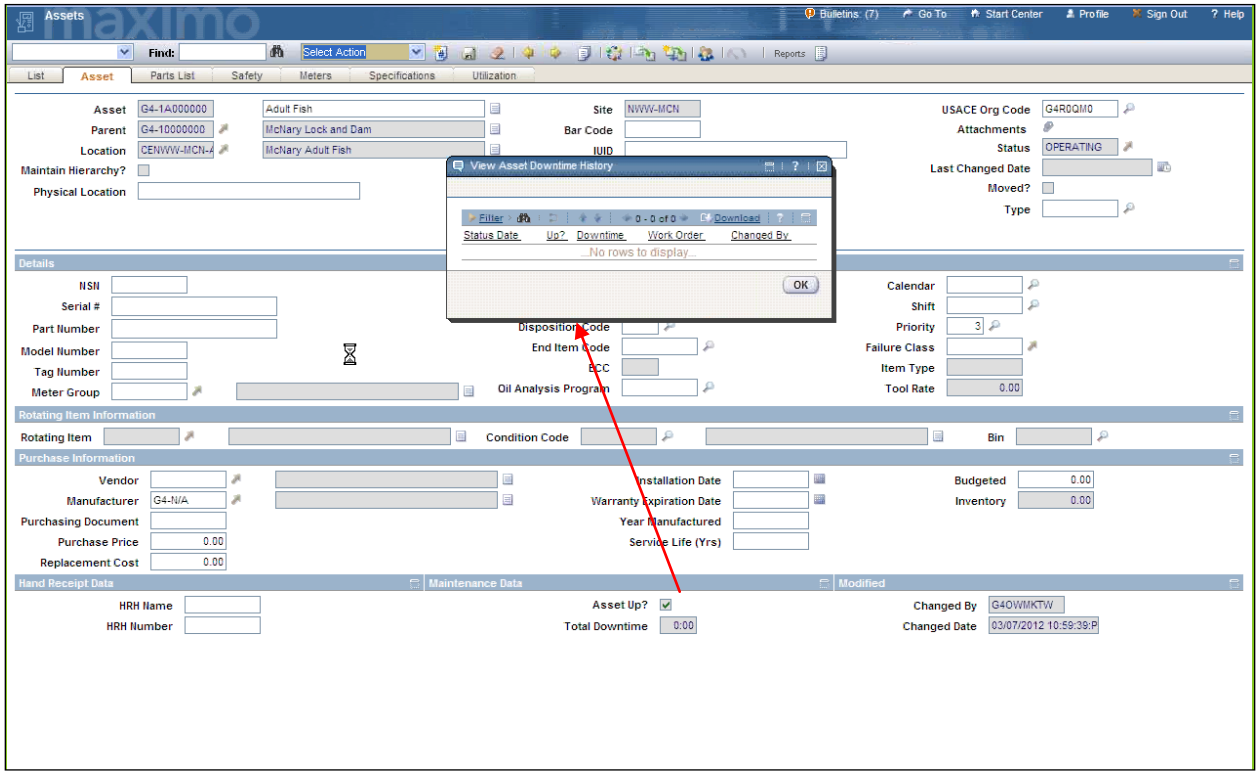
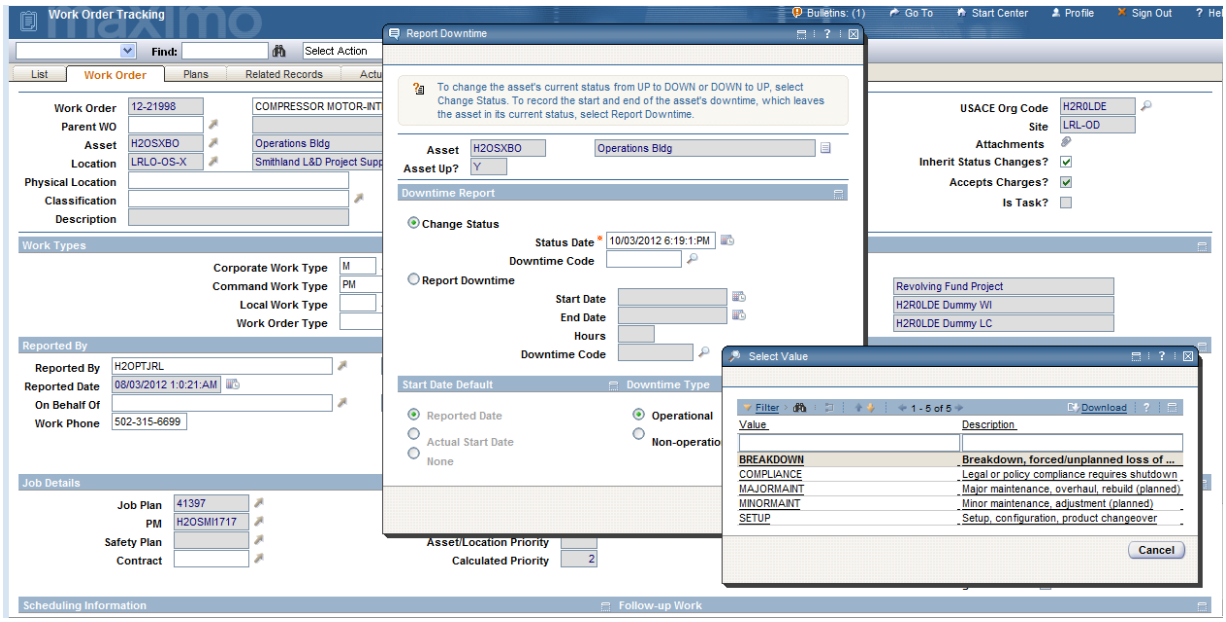


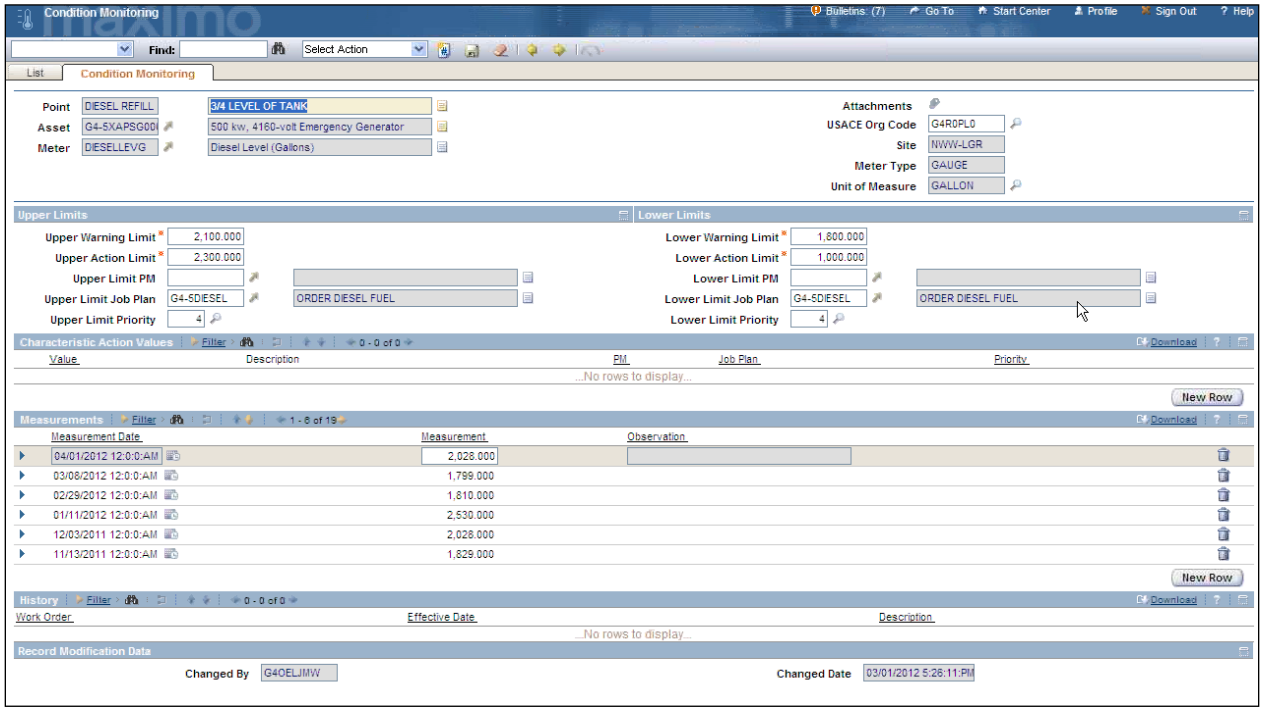
Figure 7. FEM downtime (details) reporting selection.



2.14 Condition monitoring

FEM includes pages for collection of condition monitoring data. USACE does not use the FEM "Condition Monitoring" capability, except in a few instances where individual projects are monitoring some gauge and characteristic markers (e.g., fuel levels, oil quality) as shown in Figure 8. Currently there are three condition types: "Continuous" (e.g., odometer), "Gauge" (e.g., pressure) and "Characteristic" (e.g., OCA rating). There is no preset, generic set of categories for Characteristic meters. Instead, these categories would be set up for a particular asset by using picklists. Potentially, this capability could be used to capture OCA data for the infrastructure or other condition data more closely linked to maintenance effectiveness.

Figure 8. FEM condition monitoring selection.

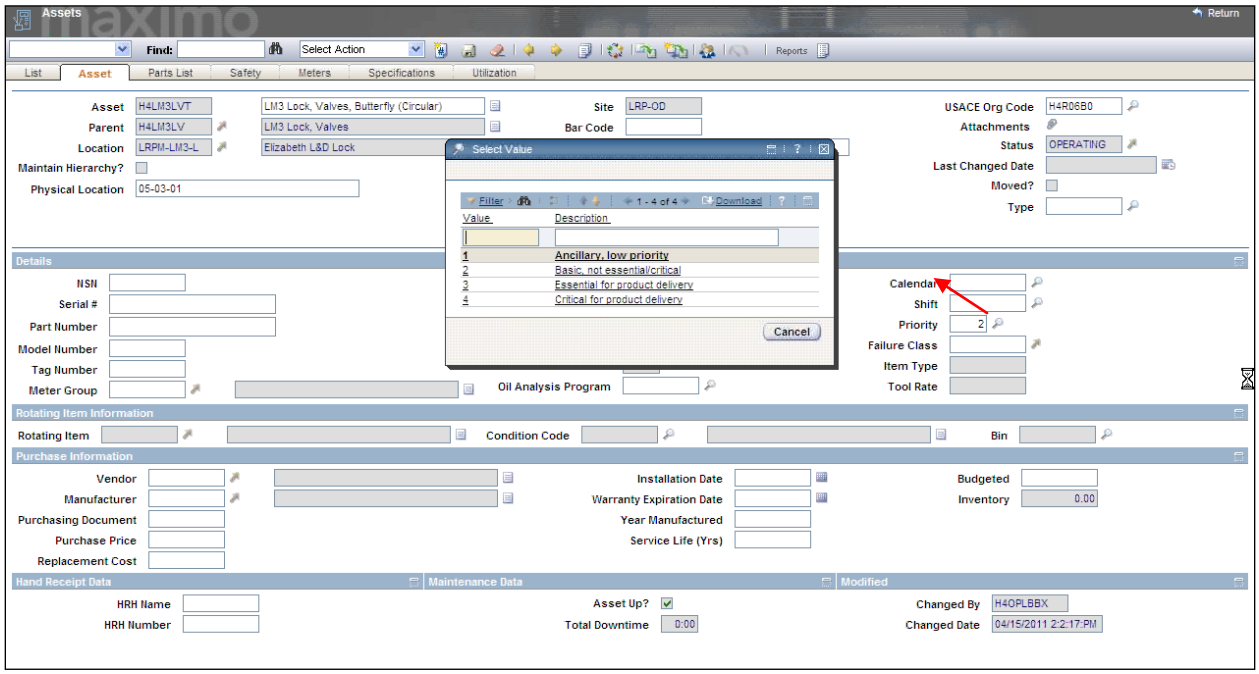


2.15 Asset prioritization

USACE does not use FEM's "Asset Prioritization" capability. The first step toward usage would be to determine how this capability would be used. Among other possibilities, it could potentially be used in conjunction with work order prioritization to help focus maintenance on more critical components, but USACE does not have any guidance for applying such a prior-

itization. Figure 9 shows the FEM input options for asset prioritization. These choices can be revised as needed. As part of a MER at New Cumberland Lock and Dam, an attempt was made to prioritize assets. This attempt is further discussed in 3.3.

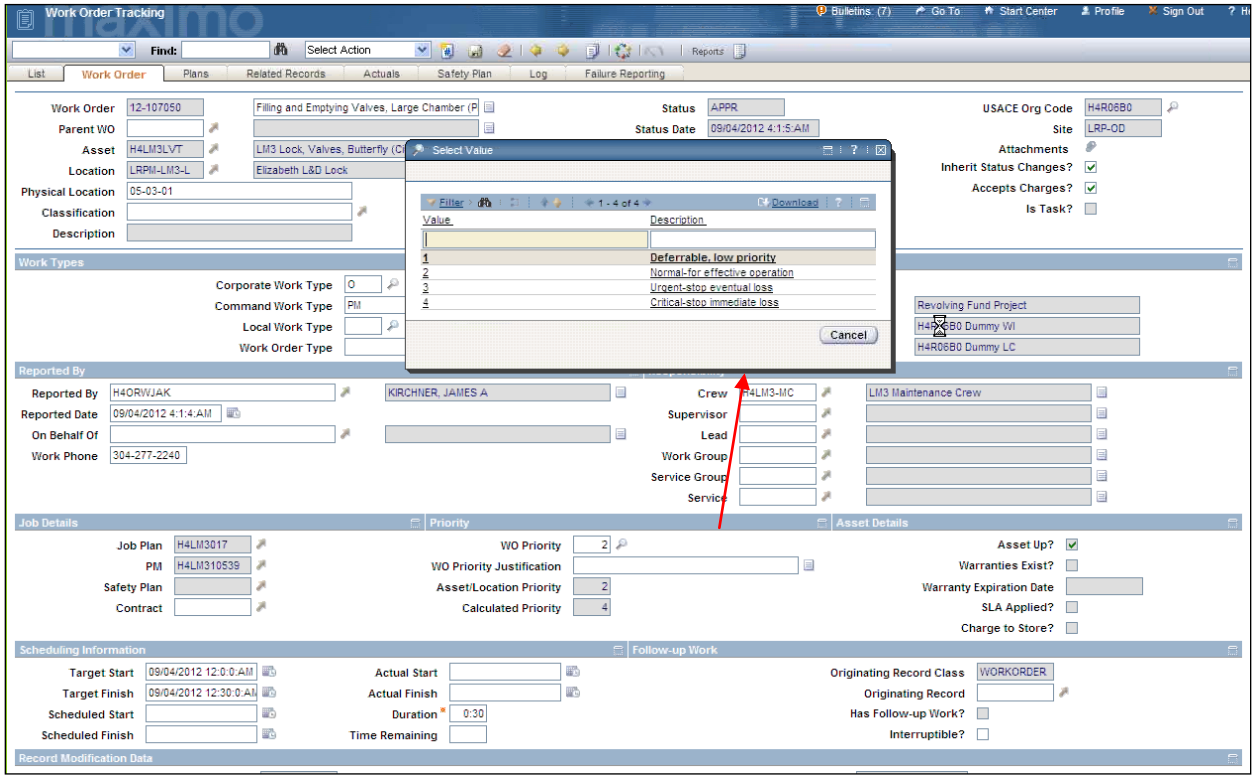
Figure 9. FEM input options to prioritize assets.



2.16 Work order prioritization

USACE does not use FEM's "Work Order Prioritization" capability. The first step toward usage would be to determine how it would be used. It could potentially be used to help focus maintenance on more critical components, but USACE does not have any guidance for applying such a prioritization. Figure 10 shows the FEM input options for work order prioritization. These choices can be revised as needed. As part of a MER done at New Cumberland Lock and Dam, an attempt was made to prioritize work orders. This attempt is further discussed in Section 3.3.

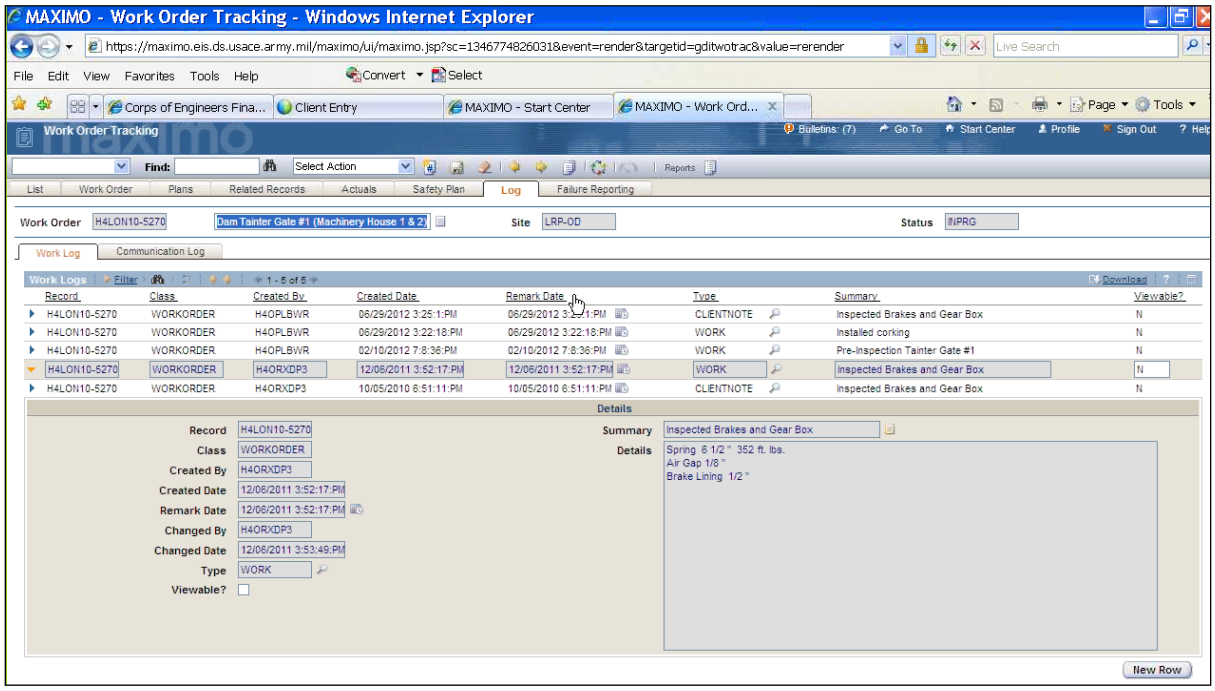
Figure 10. FEM input options for work order prioritization.



2.17 Standing work history

Standing work history (SWH) is a FEM option that was added for LRD, although it is available for all users. SWHs are work orders that stay open and are used to record various information on individual components or equipment, including almost anything except routine maintenance tasks. The objective was to record information that would have been kept on handwritten maintenance cards. Figure 11 shows a SWH with the “Details” field where most of the information is recorded. This information includes most non-routine maintenance, fuel deliveries, new equipment, parts replacements, etc. FEM has other data fields for recording most of this information, but the SWH allows the personnel to transition from past practice with the least amount of change. When information on unscheduled maintenance is recorded in SWHs, this creates an obstacle to statistical searches related to maintenance effectiveness. One option for a more standardized recording of some of this information (e.g., measurements, meter readings) is to use the condition monitoring capability discussed in Section 2.14).

Figure 11. Standing work history selection in FEM, showing the "Details" field where most of the information is recorded.



3 Maintenance Effectiveness Review

Once an organization has a maintenance management system implemented and is using it to manage and collect data on maintenance and repair, a MER can be used to verify the job plan's applicability and effectiveness. Basic questions include: (a) whether there is degradation to the asset that is affected by maintenance, (b) maintenance task needed and type needed, (c) consequence of functional failure, and (d) current maintenance cost effectiveness and how it might be improved. If data has been collected about the application of job plans, this can also be used to justify task, frequency, or cost modifications. A MER also provides a good opportunity for engineers and designers to interface with maintenance mechanics.

For an organization that applies maintenance per manufacturer recommendations or possibly applies maintenance even more extensively, savings can often be achieved by reviewing maintenance effectiveness. Naval Sea Systems Command (NAVSEA) reports the MERs for various ships and infrastructure result in an average reduction in routine maintenance of 40%.[4] In cases where routine maintenance is minimal, the MER may result in increased routine maintenance.

3.1 MER pilot

In consultation with the team responsible for the Civil Works (CW) MMIP, it was decided that a MER pilot should be held. The MER pilot would serve multiple purposes to include: (1) help the research team become more familiar with routine maintenance practices at a lock, (2) provide information to the MMIP team to be used in developing and implementing the MMIP, (3) help the project maintenance personnel improve their job plans and their routine maintenance practices, and (4) help all three groups better understand how to use FEM in the USACE business process.

Given that USACE had never performed anything like a MER prior to this pilot, the specific activities and results were not completely certain. USACE participants were not familiar with the process, and the specifics

[4] Oral communication by authors with NAVSEA contractor who trains Navy users of MER process.

would also depend on the quality of the job plans for the site and how the project was using FEM in their maintenance process.

A MER was held at New Cumberland Lock and Dam. Because USACE is not applying maintenance according to uniform standards throughout its inventory nor is it collecting the types of maintenance data that might allow estimates of reliability that would be typical for an organization with a mature maintenance management program, the MER had a somewhat different focus than it might otherwise have had. In this case, the primary activity was to review and improve the text of job plans. Prioritization capabilities within FEM were also reviewed, and an attempt was made to apply them to assets and job plans. Many useful results came out of the MER. The authors gained a much better understanding of the operation of a navigation lock and the maintenance that is performed on it.

Only a small part of FEM's capabilities are being used, so there is a lot more that could be done with minimal or no additional effort to benefit the project directly and also to provide more information for understanding USACE maintenance practices.

Some unforeseen issues affecting the maintenance practices and priorities of the lock personnel were discovered; these issues are outlined below.

- An expectation by personnel of never being able to replace items deemed noncritical, or only being able to do so with expenditure of excessive time justifying, purchasing, and (as applicable) installing. This results in what may be excessive efforts to avoid the breakdown, failure, or wear-out of any piece of equipment regardless of the cost-effectiveness of these maintenance efforts.
- The sense of ownership, responsibility, and pride in the project held by the personnel. Clearly there is value to USACE in supporting that desire to make the project the best they can.
- A risk-aversion by personnel for making changes from the standard operating procedure due to their having no expectation of reward if it works and an expectation of punishment if it doesn't.

The results were moderately different than expected, but it still proved to be a useful experience. Many of the lessons learned were unexpected. (The results and lessons learned are discussed in Section 3.2.2.)

3.2 Critical and non-critical maintenance

3.2.1 Examples

Routine maintenance at New Cumberland

Service bridge elevator and crane – Typically this elevator is used infrequently, and there is a ladder which can be used as an alternative; however, the elevator becomes more critical when personnel need to pass ice in order to lock tows through. Under these conditions, personnel need to be able to operate the bulkhead, and that requires use of the elevator to access and operate the crane on the service bridge. Under these conditions, the crane becomes critical and the elevator can be, too. In addition, these same conditions often result in an icy ladder that is a safety hazard to use in the absence of an elevator.

Lawn tractor – Besides being used to mow grass, this device is used to plow snow on the lock walls. Without it, it would not be possible to use the carts in snowy conditions to get to controls at each end of the locks, and walking to the controls would be difficult or potentially dangerous with snow melting and refreezing. In addition, this tractor is used to extend the cable to pull a split tow through the auxiliary lock because this lock has no rabbit for accomplishing that task.

Electric carts and chariots – These devices are not mission critical, but their loss is an unacceptable condition. Walking would delay lockage and increased staffing would be very costly relative to the cost of providing and maintaining the carts.

Power washer – This device is used for many tasks including cleanup of some other equipment; however, the use most closely related to USACE mission may be for clean up after flood. Flooding of the lock wall is infrequent, and cleanup can be mostly accomplished using a pump and small fire hose. Flooding of the galleries is more frequent. While it doesn't happen every year, some years it can occur multiple times. The power washer is the most cost-effective option for this task. If funds for replacement were certain, it might be cost effective to not maintain power washers and replace them upon failure.

"Big M" crane maintenance at Wilson Locks

While this example of maintenance was not part of the MER, it is relevant to the issue of M&R for critical and non-critical components, so it is addressed here. Personnel reported that these cranes are frequently used for critical maintenance, but they are old and frequently break down. Personnel also reported spending significant maintenance hours repairing cranes that are beyond their serviceable life. This need for frequent repair means not only a potentially costly life cycle for the cranes, but it also reduces availability of labor hours to work on equipment considered more critical. This need can result in conflict because there are a limited number of hours available for maintenance, but these cranes have to be made operational first because other maintenance and repair can't be completed without them. However, it should be noted that because these cranes are not used to lock tows, they are not considered "critical" within the current AM framework.

3.2.2 Discussion

With the possible exception of the service bridge elevator, the equipment at New Cumberland in these examples is performing adequately and does not need to be replaced. A question that was common throughout the MER is whether maintenance should be applied intensively, moderately, or not at all (i.e., run to fail) for particular equipment. This is a complex and situationally dependent question, and some aspects are addressed further in this discussion.

The pieces of equipment listed in Section 3.2.1 were specifically chosen as examples because they may not be considered "critical" to most people not working at a lock. There is a Headquarters (HQ) USACE-level effort to focus maintenance and repair on critical components. However, this focus may not be optimal, because it has some faults. For example, it ignores or minimizes various aspects of maintenance effectiveness. The crane example discussed above shows where non-critical equipment can be a requirement for maintenance of critical equipment. Also, other equipment that is typically not critical can be critical to operation under certain circumstances or critical to efficient operation. While the cranes at Wilson L&D are not directly used in locking navigation traffic, and therefore not deemed critical within AM, lock personnel see these pieces of equipment as critical to performing their mission. They report that frequent breakdowns and labor spent repairing these cranes interfere with performing

their other duties, including maintaining the mission-critical equipment. The annual costs for crane operation may also be higher than optimal (compared to replacement).

Another area of potential disagreement involves smaller pieces of equipment. Hypothetically, maintenance on tractors could be cut in half (or even less) with minimal impact on expected life. In another hypothetical example, if preventative maintenance on a power washer costs $300/year and a replacement costs $600, it might be cost effective to run to failure. However, lock personnel see it quite differently. This type of equipment is used frequently and needed for safe and effective operation of the locks. Even if these types of equipment are not used in lockages, there are at least two reasons that lock personnel do not see reduced (or eliminated) preventative maintenance as a viable option:

1. They have no expectation of ever being able to replace equipment if it should break. This is especially true for items such as carts, tractors, and power washers. For this reason alone, run to failure is not an option.
2. Most lock personnel take great pride in their facilities and in their efforts to maintain the condition of the equipment. Requiring them to forego maintenance would impact morale and likely result in an undesirable reduction in productivity.

Additionally, lock personnel note that there is also a substantial labor and administrative cost to replacing equipment.

Minimizing total maintenance cost is important. That said, the impact of reduced preventative maintenance such as run-to-failure may have adverse impacts on personnel morale and productivity. It can also lead to loss of equipment with limited ability to replace. Likewise, a focus on critical maintenance may ignore the benefits of potential savings from minimizing the total maintenance cost. In either case, budget restrictions further complicate the decision process and may make it difficult or impossible to avoid making less-effective maintenance decisions.

Reaching an optimal answer is difficult, and a focus on critical infrastructure avoids at least one difficulty. If a facility needs two cranes, three electric carts and a tractor, they are likely to want three cranes, five carts, and two tractors. Developing a uniform process to identify the facility's true

needs would be difficult. That difficulty does not imply "noncritical" equipment is not needed, but optimizing the equipment and its maintenance, especially if done systematically, can be very complex.

Optimal maintenance should at minimum consider, and possibly be primarily based on, minimizing the maintenance cost (see 2.15 and 2.16 for further discussion of prioritization capabilities of FEM). If CM is expensive, or the failure consequences are high, and either of those situations can be reduced by additional PM, then the level of PM should be high. Likewise, if PM is more expensive than CM (or replacement), then it is worth considering a lower level of maintenance. See Figure 12 (in Section 4.3) for an illustration of the tradeoffs between more or less maintenance.

The MER and additional discussions as part of this research project indicate that routine maintenance and repair that extends or restores the service life of an asset in a cost-effective manner should be a high priority, regardless of whether the component is considered critical and regardless of its impact on the risk of lock shutdown. As mentioned previously, there are some reasons other than cost-benefit calculations to apply a greater level of maintenance. Inefficiencies will result if there is a surplus or shortage of available maintenance labor, but the targeted goal should still be to match maintenance resources to the level of maintenance.

The priorities for repairs and major rehabilitation were not a focus of the MER. Those two priorities may be somewhat different, especially for repairs that are primarily focused on reducing the risk of lock shutdown. Nonetheless, applying optimal maintenance to noncritical components can free up resources (funds and labor) for "critical" maintenance and repair.

3.3 Prioritization

During the MER pilot, it was decided that an attempt should be made to prioritize the job plans. The primary objective of this exercise was to better understand the priorities from the lock personnel's viewpoint. There was no prior preparation for this part of the exercise, and no expectation that this would result in meaningful priority ratings or a usable product.

The prioritization exercise was divided into two parts based on the first two bullets below. Each part of the exercise was scored on a 1–10 scale. Afterward, we reviewed the ratings from highest to lowest. Some were revised based on their score relative to the other job plans. It was noted that

scoring was more difficult in the absence of guidance on how the priority should be reflected in the scores. The importance of the mission was not evaluated in this exercise, but the following points were considered.

- Importance of the maintenance to the component reliability
- Importance of the component reliability to the mission
- Importance of the mission itself

3.3.1 Considerations for prioritization

The job plan prioritization exercise was valuable for a number of other reasons besides learning the lock personnel's viewpoint. It was clear that a common basis was needed for assigning priority. Priority could be based on many different concerns, and it was not clear how much weight should be given to the various reasons for performing maintenance, the potential benefits of the maintenance, or other factors. Numerous parameters are mentioned and briefly discussed below. In order to arrive at meaningful priorities, criteria would be needed to explicitly consider these issues in the prioritization process.

Frequency of application

Frequency of application is one consideration, and the following are some questions to be considered:

- Should the priority be tied to missing one application of the tasks?
- Should the priority be tied to missing 50% of the applications?
- Should the priority be tied to never doing the maintenance?

Scope of job plan

A robust job plan could potentially be pared down to include only the tasks deemed most critical. This may or may not have a significant impact on the outcome (maintenance effectiveness), but there is an open question regarding how this is to be considered when assigning a priority.

Variety of benefits accrued

The variety of benefits accrued from different maintenance activities makes it hard to evaluate and compare effectiveness. The following list gives some reasons why:

- Not completing some lubrication job plans can have a very quick impact on smooth operation and can lead to the need for corrective maintenance in the short term.
- Some job plans have minimal impact in the short term but can significantly shorten the expected life.
- The impact of not inspecting for hidden safety deficiencies (e.g., fuel spill cleanup kit deterioration) is significantly different than maintenance of active systems.
- Some job plans are required by law, such as elevator inspections.
- Some inspections are required by USACE regulation, such as those for furnace, boilers and hammer valve, air receivers, Environmental Compliance Assessment (ERGO), Failure Modes and Effects Analysis (FMEA), high stress steel inspections (HSS), and Periodic Inspection.

Failure-mode ratio

The failure-mode ratio is the percentage of failures attributable to a particular failure mode. While this ratio was not specifically addressed in the prioritization process, personnel were considering the failure modes that the routine maintenance was addressing.

Personnel were also considering the availability impact which is the impact of not having a particular component available all the time. The impact can be considered by gathering the following data:

- Percentage of mission cycles that the system is used.
- Percentage of mission cycles the system is critical.

Note that some equipment does not have a direct tie to mission cycles such as emergency safety equipment, maintenance equipment, or flood cleanup equipment.

Other equipment has a varying relationship to mission, and likewise, the failure modes may have different relationships to the missions. Reviewing a history of failures for the tractor used for grass, snow, and line hauling provides an example, as given here:

- Tractor failed to start.
- Tractor failed to start cold.
- Tractor failed to start cold in winter (snow plow more critical than grass cutting).
- Tractor failed to operate successfully.

- Mower deck failed to operate.

Past reliability

Past reliability based on the current routine maintenance practices could be considered in evaluating the maintenance priority. Unfortunately, it doesn't give a clear indication of the impact of a reduced maintenance regimen.

Mitigation or replacement

Mitigation of component failure can occur in a number of different ways or none. How should this be considered in priority of the routine maintenance?

- Maintenance crew repair
- Manual labor to replace the components' function
- Contracted services
- Reserve component

Similarly, if the component must be replaced, the impact to the mission can vary:

- Backup system not immediately available
- Backup results in delay
- Backup system not readily available

This section includes far more detail than is likely to be used within a job plan prioritization scheme. That said, it should be recognized that any less-detailed scheme is still likely to include implicit consideration of these various factors. It is possible that explicit consideration of most or all of these factors could be avoided by focusing on maintenance approaches that minimize overall maintenance cost. This approach is discussed further in section 4.

3.4 MMIP pilot

The results of the MER resulted in questions regarding the relationship between tasks in a MER and in the AM MMIP that was being piloted in each USACE division. A pilot implementation was attended, and it appears that the relationship between these two activities is mostly synergistic, with little or no overlap. At this time, details of the MMIP are incompletely understood, pending release of the draft reports. It appears that the MMIP

objective of identifying project maintenance needs is being accomplished generically for the types of infrastructure present at the project rather than for the specific components and operational environment. On the other hand, the process completed during the pilot MER focused on the specific components and operational environment at that project. Each approach has its benefits and drawbacks. Application of the same generic maintenance cost model to all projects within the MMIP does not properly account for specific circumstances at each project. If the model estimates are very good, it will be generally correct on a network level, but it will not accurately reflect the maintenance needs at any one project. The focus on job plans and tasks done within the MER captures exactly what the local experts think needs to be done, but it does not capture varying expectations from project to project and does not align maintenance needs equitably across the network. See Uzarski (2009) for further discussion of network and project-level application of maintenance management.

4 Approaches to Minimizing Maintenance Cost

The project documented in this report was a preliminary look at a few aspects of optimizing the planning and execution of maintenance to get the very best maintenance from each dollar spent and to optimize the total maintenance expenditure. There are many factors that contribute to reaching this objective. For example, USACE has historically relied on the expertise of personnel at the locks. This can work well for an individual site if the budget is sufficient. As budgets shrink, however, there is more concern about having adequate funds and a greater need to ensure one project is not overfunded at the expense of another being underfunded. Information systems such as FEM present the opportunity to analyze the most effective maintenance practices and optimize the frequency of their use. Whenever the needs exceed the funding, a results-oriented approach can be taken to prioritize maintenance and ensure the most effective maintenance is continued.

To optimize maintenance within USACE, an analysis process is needed that is based on data. However, USACE does not collect the engineering data necessary for making such an analysis. Further, determining what data is needed and how it should be used is undoubtedly a complicated issue, for which a baseball story provides an illustrative example. Baseball is a game known for a wealth of statistics. Baseball experts have always had an expectation that they knew what statistics were important and how to rate the contribution of players. The story *Moneyball* indicates that they did not. In this true story, the Oakland Athletics focused on a different set of statistics in their player selection, and they were very successful until other teams also started using these alternative selection methods. Given that USACE doesn't even collected most of the relevant maintenance statistics, one can hardly expect that it has determined what statistics are important to judging maintenance effectiveness. Even if USACE does start collecting more maintenance-related statistics, it might be a long and difficult road to optimal use of this information.

To begin understanding the difficulty, one must realize there are many metrics that can help evaluate maintenance effectiveness, starting with simple things like tracking the hours spent for each maintenance task or

the total time spent on each asset. The uniqueness of the projects, however, can make it difficult to carry these types of comparisons across projects. There are at least two other approaches that may provide greater insight into maintenance effectiveness and they are discussed below in Sections 4.1 and 4.3.

4.1 Metrics for maintenance effectiveness

As initially envisioned, the primary objective of this research project was to make a statistical comparison of the level of maintenance using FEM data to the OCA ratings of components. This objective was described in Section 1.3 and tasks #3–4 are restated below.

3. Pull maintenance data from FEM that relates to a condition rating in the Inland Navigation OCA.
4. Examine the data subset from step #3 for certain fields that we think correspond to condition: failure data, installation date, and frequency of Preventive or Corrective Maintenance (PM or CM).

It was quickly learned that the installation date for nearly all components is not being recorded in FEM (if it is even known); even when captured, the date is more likely to be in a remark field that cannot be queried by date and is not easily searched by any method. Failure data for lock components also is not being captured except occasionally in remarks.

As for frequency of maintenance, this is typically being captured in FEM. Maintenance is described using job plans and is planned by preventative maintenance schedules that generate work orders which most users will record as closed when they have been completed. What is less clear is what maintenance is being performed and how it relates to an OCA rating.

4.2 Failure recording

4.2.1 Recording date of installation

Recording the installation date would seem relatively easy and straightforward, but it is not. The primary complication is determining whether a rehabilitated component is new when a portion of its parts have been repaired or replaced. Criteria for judging this can be created, but it will take a significant effort to do the job well. This work would require an initial effort to develop guidance that can be consistently applied across the in-

ventory to identify the metrics for replaced (new) versus simply being repaired. There are at least two ways to minimize the ambiguity of repair versus replace: (1) focus on the smallest components possible, and (2) focus on failure modes.

4.2.2 Failure modes

Recording failures unambiguously also requires a focus on failure modes, and Wiebull models are only applicable to failure data collected at this level. Because USACE operates locks of unique designs, loadings, and usage with diverse components of varying size and manufacture in diverse environments, good failure data also requires more information to understand the contribution of each failure mode to the observed failures. The question is how this information should be captured. Demand versus capacity is important, but it seems reasonable to ignore this for most USACE lock infrastructure which is usually designed for much higher loads than typically seen. Usage or loading cycles are very important. Age may also be useful as a crude approximation of many age-related contributors to failure, but age does not account for the uniqueness of each USACE structure. One way to capture the uniqueness is by condition ratings that focus on each failure mode. Thus, a failure rate relationship can be developed based on usage and condition.

4.2.3 Condition vs maintenance

The relationship between condition and maintenance probably is not nearly as simple as looking at the maintenance frequency. First, there is a need to account for the uniqueness of each site. The condition measures must also be aligned with distresses that are associated with the type(s) of maintenance being applied. If this isn't difficult enough, there is also a matter of the different levels of maintenance that are applied at different frequencies (which may be changed over the years) for different failure modes, and the failure being prevented may be years or decades into the future. A rough approximation of the maintenance level may prove useful but it may take some thought and expertise to develop.

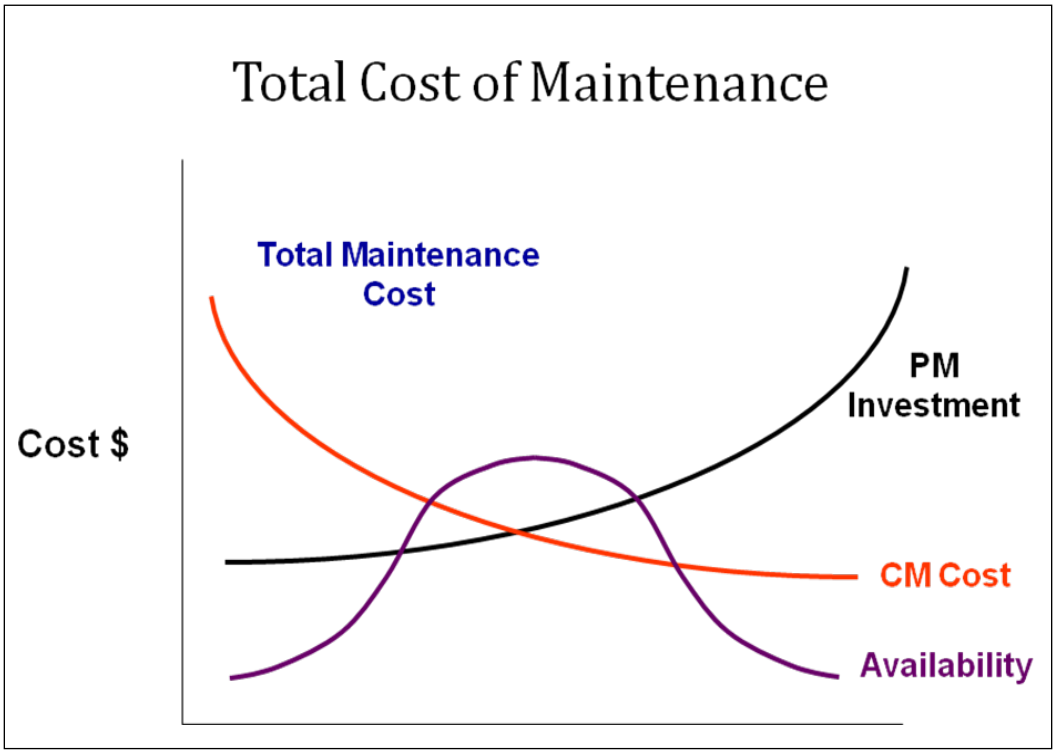
The relationship between condition and corrective maintenance is likely to be the most difficult to measure meaningfully. One factor is ensuring the conditions being measured and the deficiencies being corrected are appropriately aligned to each other. As with preventative maintenance, the deficiencies and failures being corrected may occur at very wide intervals. If

the corrective maintenance is done during scheduled dewaterings, the corrective maintenance may be more highly correlated with opportunity than the current need for repair.

4.3 Corrective versus preventative maintenance ratio

Theoretically, one of the simplest measures of maintenance effectiveness is to compare the PM cost to the CM cost and loss of service. An illustration is shown in Figure 12.

Figure 12. Example of optimization of total maintenance cost minimization.



The goal of maintenance cost control is to optimize the PM and CM to maximize availability of an asset or component. Figure 12 suggests that the optimal expenditure might be equal parts PM and CM, but this graph is only illustrative and should not be read to indicate that. The actual slopes could be much different, and the availability curve may be shifted significantly one way or the other. Optimization would require capturing information on the maintenance (PM and CM) applied at each project and for each asset, as well as recording failures, failure modes, and availability impacts. While improvements could be made, information can already be collected in FEM for PM, failure reporting, and availability. However, a

method for collecting CM information is not defined and is not a current capability of FEM. Completion of some PM and much of the CM for the most critical lock components occurs during lock dewatering. Because much of the cost is associated with the dewatering itself and not the actual maintenance and repair, there would need to be a clearly defined process for assigning costs to PM versus CM and to individual assets within the lock structure. Additionally, the costs of an actual dewatering are a significant added maintenance effort that must be accounted for.

While looking at the ratio of PM versus CM could provide some very valuable insights, it leaves one big question unanswered—is the specific PM or CM that is being applied considered to be the most effective use of PM or CM dollars, respectively? While having good maintenance personnel with authority to make the decision of whether the maintenance is needed partially addresses this question, most likely it brings the analysis back to looking at maintenance by a method based on one or more of the metrics reviewed in Section 4.1.

4.4 Miscellaneous approaches to optimize various aspects of routine maintenance

Sections 4.1 and 4.3 have presented two alternatives for high-level analysis of maintenance effectiveness. In addition, there are many other ways that key aspects of maintenance effectiveness can be targeted and improved on a more targeted basis. Most of these methods require more data than is currently being collected in FEM in order to implement them effectively and/or verify their success. A discussion of other ways to achieve maintenance effectiveness includes:

4.4.1 Hidden failure data

Hidden failures occur on components and equipment not used continuously. The longer the dormancy, the more likely it is to have a hidden failure or to fail upon startup. Inspection and testing is needed to find these failures. Inspection may be too frequent or not frequent enough and too extensive or too limited in scope. Data could be recorded regarding how often the problem being inspected is found, how easily it can be identified by inspection, how much effort the inspection requires, the potential for damage resulting from the inspection, and how important it is to find it.

4.4.2 Time-directed preventive maintenance

Time-directed PM can be cost effective where the need is known to be regular, the condition is difficult to assess, or damage can occur prior to the condition deficiency being apparent. The difficulty can be in determining the optimal frequency. For example, a standard rule of changing the oil every 3,000 miles is very conservative. It the cost is reasonable compared to potential consequences, this may be acceptable. Another approach would be to perform oil analysis to determine if the viscosity and dirt level are acceptable. This would be condition-directed but could be used for a short time to determine the optimal time-directed frequency. Without analysis of the time-directed tasks, inappropriate maintenance levels can be perpetuated, wasting resources.

4.4.3 Condition-directed or corrective maintenance

For infrastructure that is relatively cheap to replace compared to the cost of performing PM, it may be advantageous to only apply condition-directed and corrective maintenance. Condition-directed maintenance can also be optimal for assets that are very expensive to apply a maintenance cycle. Condition directed tasks may provide a less expensive option if the condition can be determined much more cheaply. Condition directed maintenance adds a step to the maintenance process (verification of condition) so data is needed to verify this additional effort is cost effective.

4.4.4 Usage-based maintenance

Manufacturers often recommend time-based maintenance based on frequent or continuous usage. USACE will often use equipment on a less frequent basis. Revising PM schedules based on usage can reduce maintenance requirements.

4.4.5 Waiver of maintenance

Time-based maintenance is often conservatively applied. Cost reductions can be as simple as changing frequency of lubrication from 2 weeks to 3 weeks and inspecting at 2 weeks. There is always the potential that reduced maintenance will be insufficient. One approach is to approve a waiver for test of a maintenance reduction at one site or even for one component.

4.4.6 Tracking work order costs

As mentioned in 2.6.2 and 2.11, detailed planning and estimating costs of tools, materials and labor as well as recording actual usage and expenditure for completion of work orders supports maintenance management in various ways.

4.4.7 Other reporting metrics

Condition reporting, failure reporting, and downtime reporting all provide valuable information for assessing the effectiveness of maintenance practices. In order to use these effectively, USACE needs to develop standard guidance for how and what needs to be recorded.

4.5 Management practices for optimizing routine maintenance

USACE has no maintenance management program. There is no formal process for determining what maintenance should be performed. There is no process for personnel at a lock to get approval for changes to their routine maintenance practices. Maintenance is planned and performed on an ad hoc basis based on individual experience and past practices. If maintenance effectiveness is to be analyzed for determining how to improve practices, there needs to be a formal process for determining and revising job plans.

There is no process for standardization across Districts, Divisions, or USACE. While the lock infrastructure at each project is mostly unique to that site, there are some components that are common to multiple sites. Some lock components and most on-lock equipment is similar enough at multiple sites so that the same job plans could be used. If many of the job plans and PM schedules were shared by many projects, this would create more opportunity for measuring and analyzing maintenance effectiveness.

Some project managers and personnel are inclined to implement intensive maintenance. In many circumstances, this tendency is good. It prevents costly shutdowns and reduces replacement costs by extending asset life. Project personnel typically have a pride in their projects that is valuable because it leads to a good work ethic. This should not be minimized. There are a number of factors that drive decision making that may not be optimal. In some circumstances, particularly for equipment that can be replaced readily and cheaply, a very high level of maintenance may not be

cost effective. Their pride in the project also leads them to want to perform the highest level of maintenance, regardless of whether it is cost effective. There is also an uncertainty about whether they will be able to replace failed equipment not absolutely critical to day-to-day lockage. This can also lead to excessive maintenance. This effort to avoid any failure (no matter how important to lock operation) is not inherently bad, but should be an explicit consideration in any review of maintenance effectiveness.

5 Other Topics

5.1 Age to condition comparison

Asset management uses age (and variations of age such as usage) as a measure of reliability. Weibull analysis can be used to estimate reliability based on age. Because the OCA ratings are used as an indicator of reliability by adjusting the age-based Weibull curve for a particular component, it was deemed worthwhile to look at how the condition of components compared to their age.

It was known from the beginning that this comparison would be negatively impacted by at least two sources of error. First, the age data that is available with the OCA ratings is for the project, not the components. Data indicating which components might have been replaced since original construction was not available. Second, it is unclear why so many of the ratings were B (with a few higher). Possibilities include the successful completion of repairs to address most deficiencies in condition, condition rating criteria that is skewed (appropriate or not) to result in mostly B ratings, other unidentified causes, or some combination of these causes.

The list of all components assigned an OCA rating was downloaded from the AM website's OCA viewer.[5] This data, containing over 160,000 entries, was exported to a Microsoft® Excel™ file. The viewer and export data fields are listed in Table 5. This list was then reduced to about 1,000 unique entries, and some key components were selected for further investigation. In order to more easily compare the condition and age of the components, the OCA ratings (initially letter grades with pluses and minuses) were translated to a point system for sorting and filtering (Table 6).

[5] https://assetmanagement.usace.army.mil/FRM/AnalyticsDev/

Table 5. Comparison of AM viewer and export data fields.

AM Analytics viewer fields	AM Analytics export fields
Division	Not included
District	Not included
Project Component Type	Not included
Subcomponent Rating (Letter Grade)	Group
Date in service (PROJECT date in service)	Component
Not included	Rating
Not included	Date in service
Not included	Project ID
Not included	Component ID
Not included	Comment
Not included	Group Comment
Not included	Group ID

Table 6. Conversion of OCA ratings to numerical values.

A	+	A+	15
A		A	14
A	-	A-	13
B	+	B+	12
B		B	11
B	-	B-	10
C	+	C+	9
C		C	8
C	-	C-	7
D	+	D+	6
D		D	5
D	-	D-	4
F	+	F+	3
F		F	2
F	-	F-	1
COMPLETE FAILURE		COMPLETE	0

OCA ratings of B- or less indicate reduced functionality or non-compliance with operational requirements. Only these ratings were used to create age versus condition plots. Linear trend lines were added to the charts and standard deviations were calculated. Afterward, in order to look at infra-structure with fewer replacements, a reduction in the selection of “Years in

Service" was made from the entire range dating back to 1916 to more recent data of only the last 40 years. Additional charts were developed for the same components (Figure 13, Figure 14, and Figure 15). By comparing charts for identical components, changes in trend lines and standard deviations of the select data were observed.

Figure 13. Foundation System, 1970s to present – negative slope.

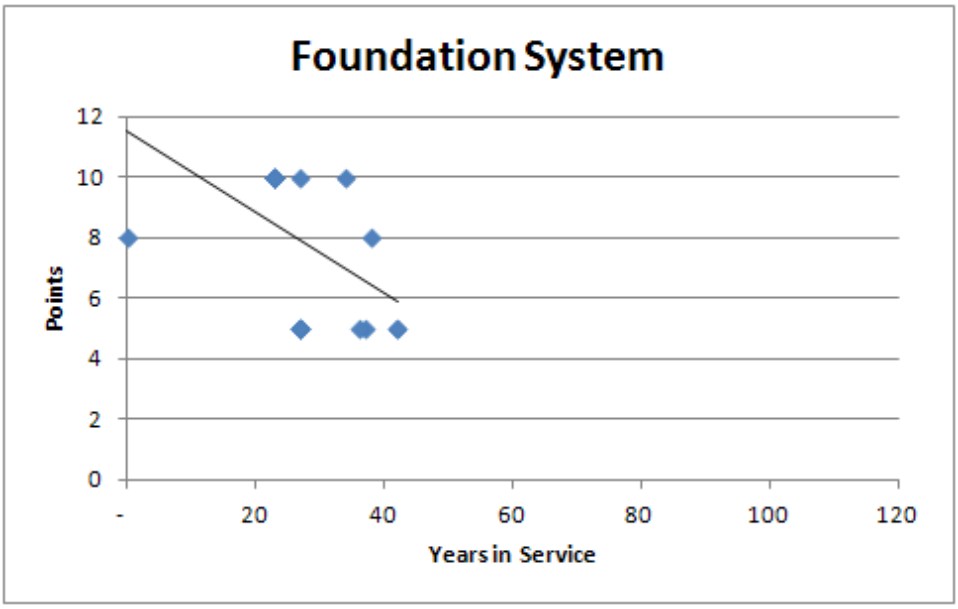


Figure 14. Quoin Blocks (on gate) – positive slope.

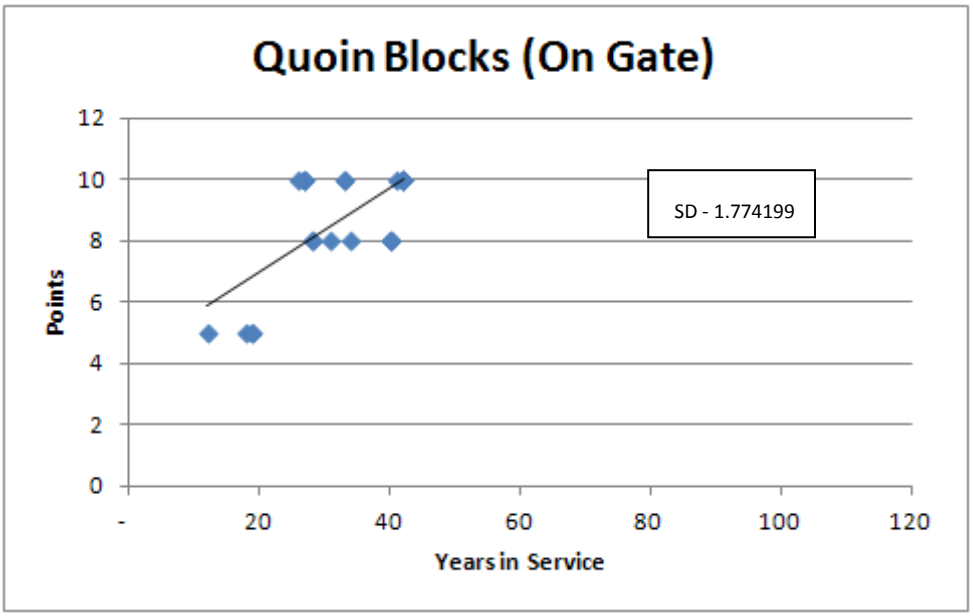
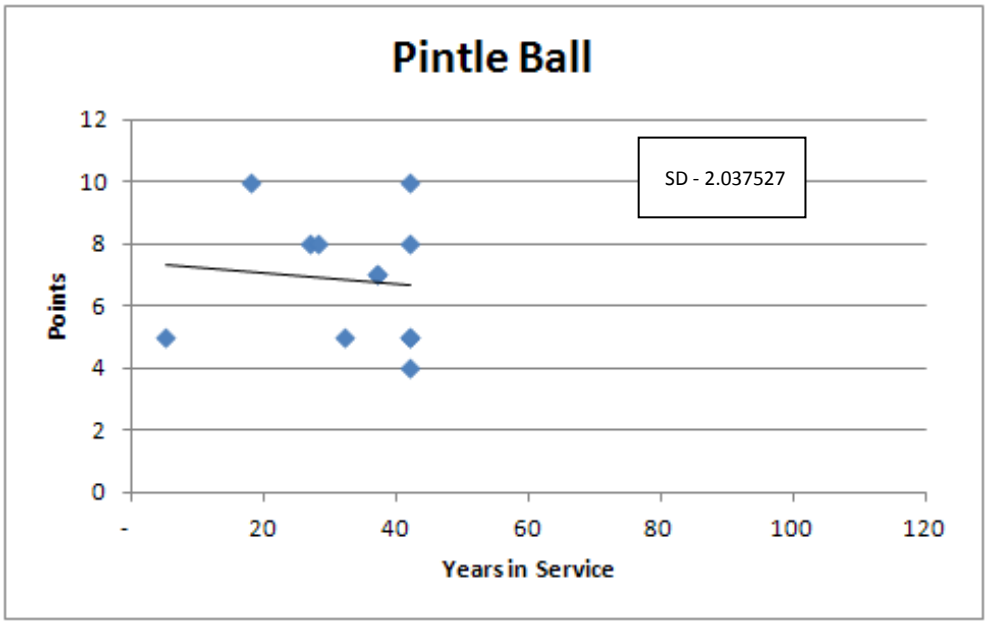


Figure 15. Pintle Ball – negative slope.



When the reduced amount of years was used, various components' trend lines showed various changes in slope direction (i.e., positive to negative and vice versa). In most cases, the data had a larger concentration with older projects, causing the angle of the components' trend lines to shift as the range of years was increased. This behavior can be observed when comparing Figure 13 and Figure 16.

Three typical changes were observed when selecting more recent projects. When comparing Figure 13 and Figure 16, we can observe how the trend line, initially strongly negative, became less negative. Another observed behavior was seen when comparing Figure 14 and Figure 17, where a sharp difference in slope direction and magnitude occurred. This behavior was observed, yet in the other direction when comparing Figure 15 and Figure 18. Standard deviations were reduced when the selection was reduced. While this reduction may not be statistically significant, it might be expected since older projects are more likely to have replaced components and therefore a lower correlation of project age and component condition.

Figure 16. Foundation System for expanded time period.

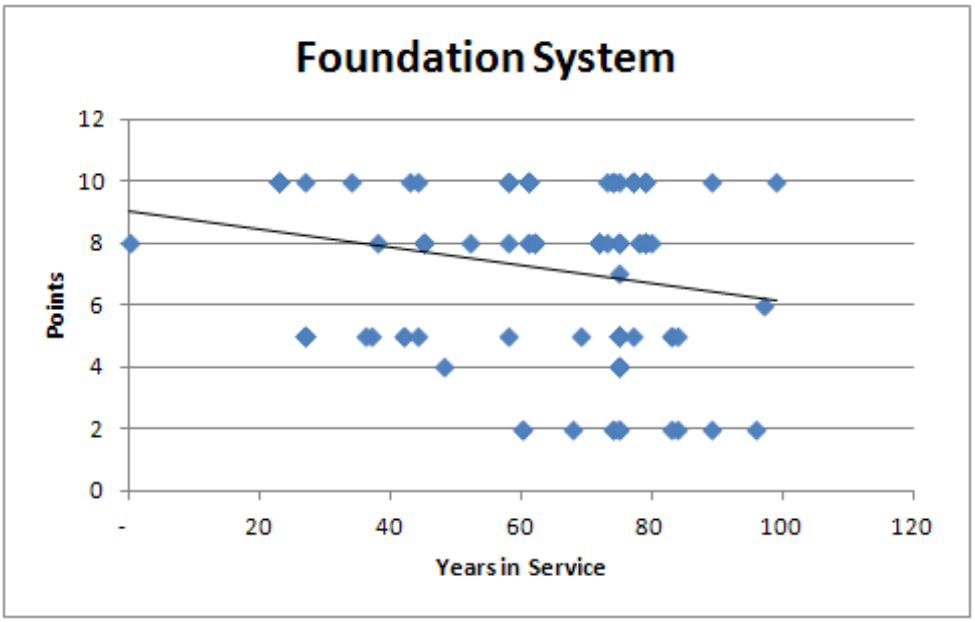


Figure 17. Quoin Blocks (on gate) – negative slope.

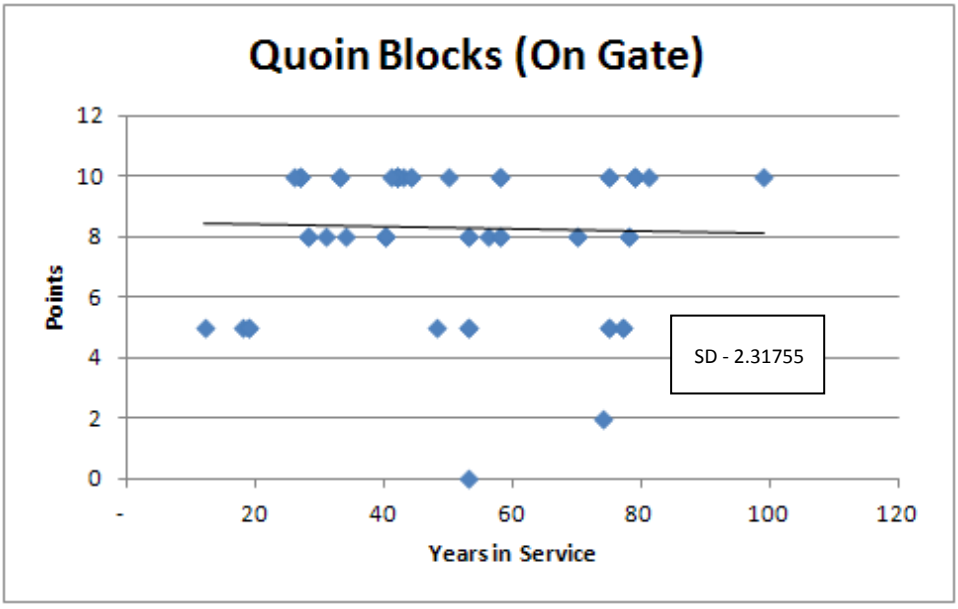
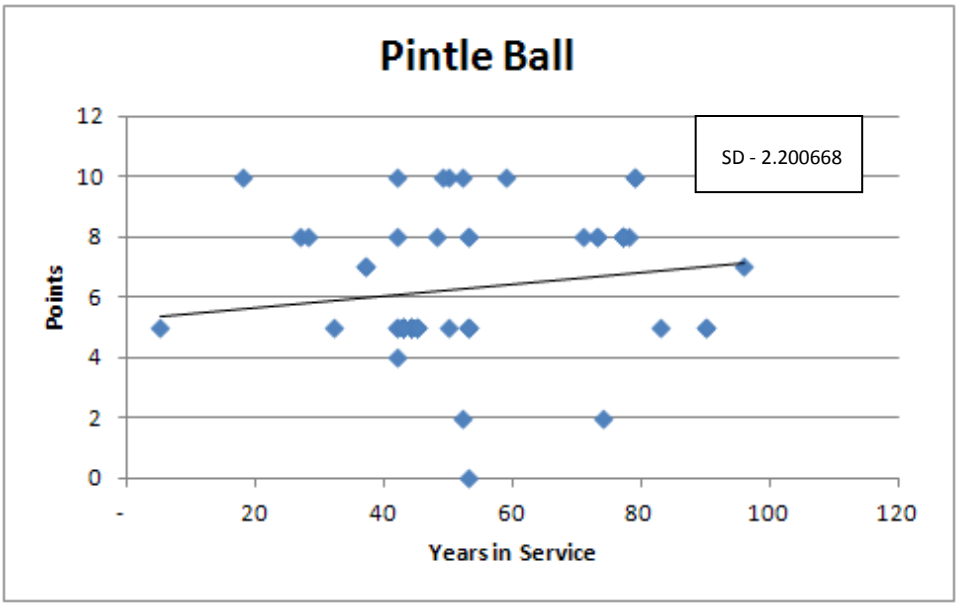


Figure 18. Pintle Ball – positive slope.



The handling of the data and observation from the charts prompted certain concerns and suggestions, as listed below.

- Project Date in Service is used, where component date in service should also be recorded.
- Time is currently used to relate the ratings of all components. This metric might not necessarily be the most appropriate for all components, e.g. usage or an alternate measurable parameter
- Frequency of components' repairs and replacements is not recorded.
- The OCA rating system is used to determine a component's condition. However, without any historical record this presents the issue of how close these ratings are to the actual "condition" they represent. Additional factors that could assist in addressing this issue are below.

    - Physical deterioration
    - Remaining life
    - Current reliability
    - Degraded service
    - Maintenance requirement
    - Subcomponent weighting

- Over 90% of components have a "B" rating. As projects age, components are replaced, repaired, and maintained at this rating.

    - How often would they receive a lower rating?
    - How often do these repairs and replacements occur?

- How costly are these repairs and replacements?
- What information is missing from a “B” ratings?
- How long does a component maintain a “B” rating?

In general, the data show a large majority of “B” ratings, suggesting relative reliability and functionality of the components and subsequently, systems and each project as a whole. This majority, together with all available data, was weighted heavily towards projects with increased age. Since the data was ordered by “Project Date in Service,” without additional information this could indicate a large probability of increased maintenance as age increases in order to maintain the minimum allowable condition rating. As a result, though age and condition should be correlated, the available data is not adequate to support the hypothesis.

5.2 Lock closure causes

Lock closures hinder traffic through the waterways. As a result, acquisition and analysis of available data should be done in an effort to better understand the nature of and minimize lock closures. To this end, an emphasis should be made on identifying the cause and occurrence of the closures. In order to increase effectiveness and efficiency, lock closures caused by repairs, maintenance and malfunctions are of interest. With an ageing navigation infrastructure, these types of closures (either scheduled or unscheduled) have the potential to increase in occurrence, length, and cost.

While neither FEM nor Operations and Maintenance Business Information Link (OMBIL) are currently used to record specific engineering related details of a lock shutdown such as the specific components that fail, failure mode, age, usage, environmental exposure, condition, etc., OMBIL does record scheduled and unscheduled lock shutdowns. This data is analyzed further in Section 5.3.

5.3 Operations and Maintenance Business Information Link lock closure data

Lock closure data is accessible though the OMBIL website (Figure 19). As this website queries a very large database, constraints are required to better locate the desired information. For the user to constrain the data, a new window opens (Figure 20), displaying the available graphical user interface (GUI) to view and query the database.

With the data available in this database, focus was on lock closures caused by repairs, maintenance, and malfunctions. In order to retrieve this data in a manageable manner, a series of variables had to be selected within the desired fields. With the display shown in Figure 21, selected fields with relevant variables were:

- USACE Hierarchy
  - All USACE
- Measure
  - Scheduled Unavailability
  - Unscheduled Unavailability
  - Total Unavailability
- Time
  - Calendar Years
- Unavailability Codes (29 distinct categories)
  - EE - Repairing lock or lock hardware
  - R - Lock hardware or equipment malfunction
  - T - Maintaining lock or lock equipment
  - All Unavailability Codes

Once the desired variables are selected, a table is displayed presenting the queried data (Figure 22). This table can be adjusted to display the data in various ways, as seen by comparing data displayed in Figure 22 and

Figure 23. This data can then be exported to an Excel file for further analysis.

Figure 19. OMBIL website with numbers added to show order of selection during task.

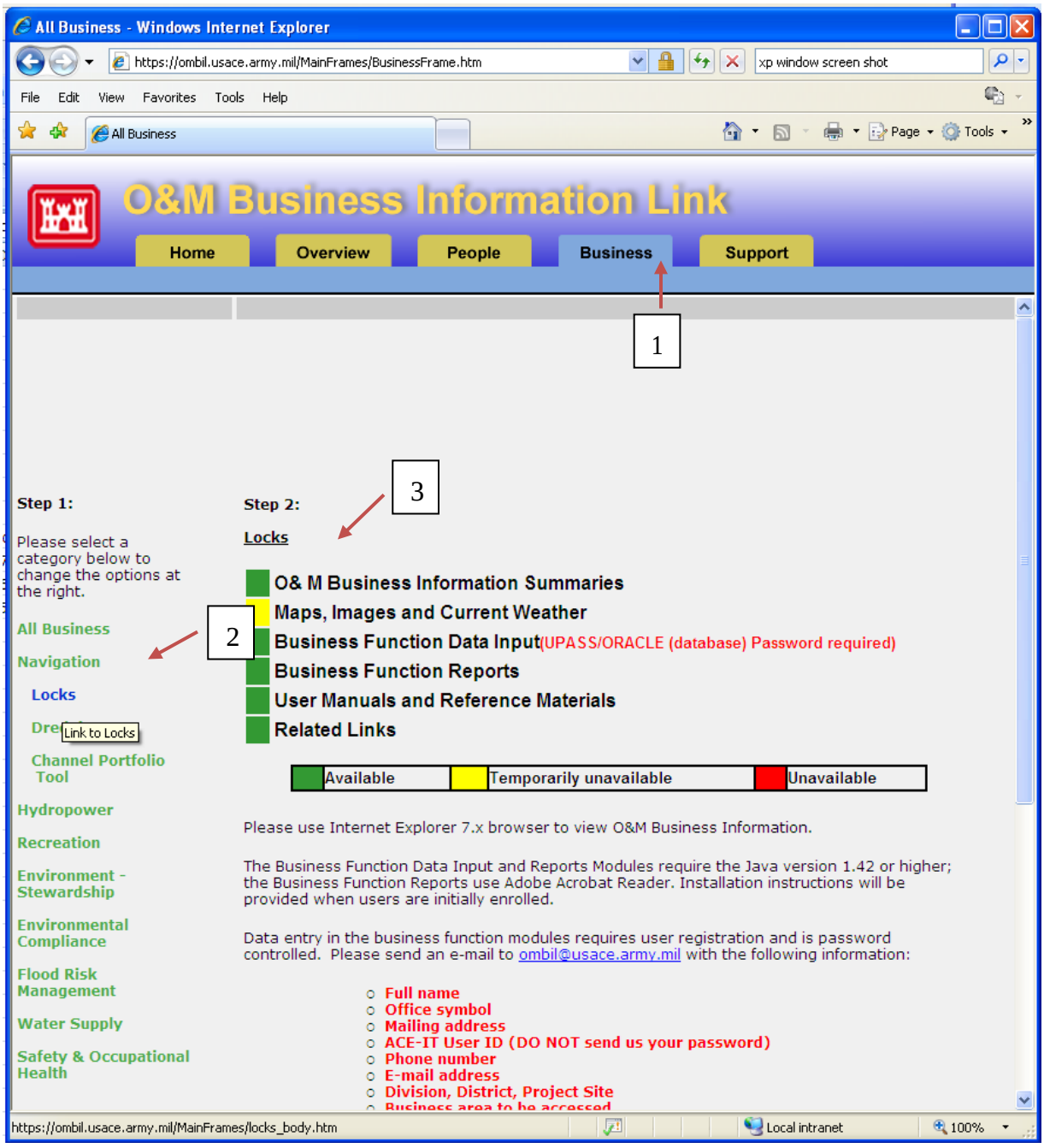


Figure 20. Graphical user interface to query database for desired variables.

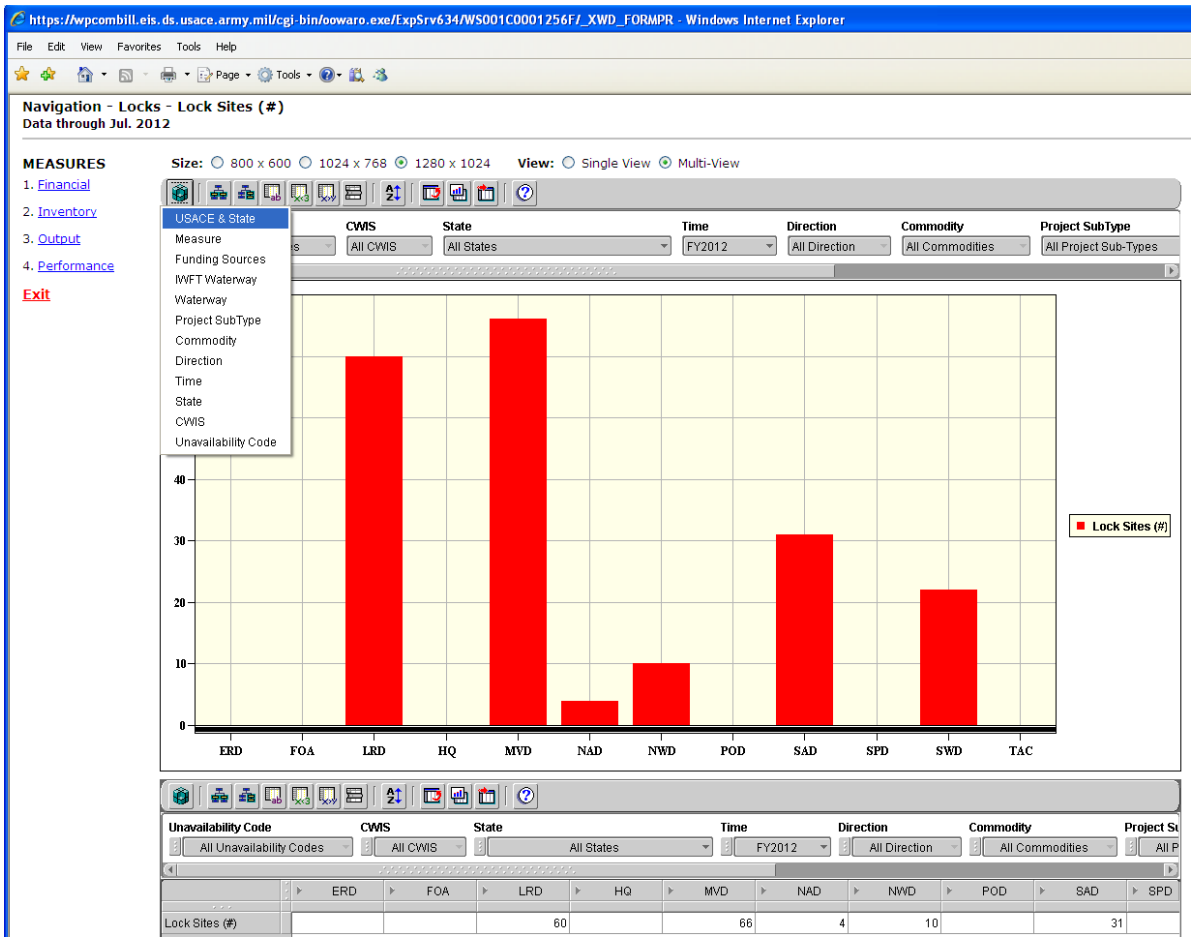


Figure 21. Field/variable selection.

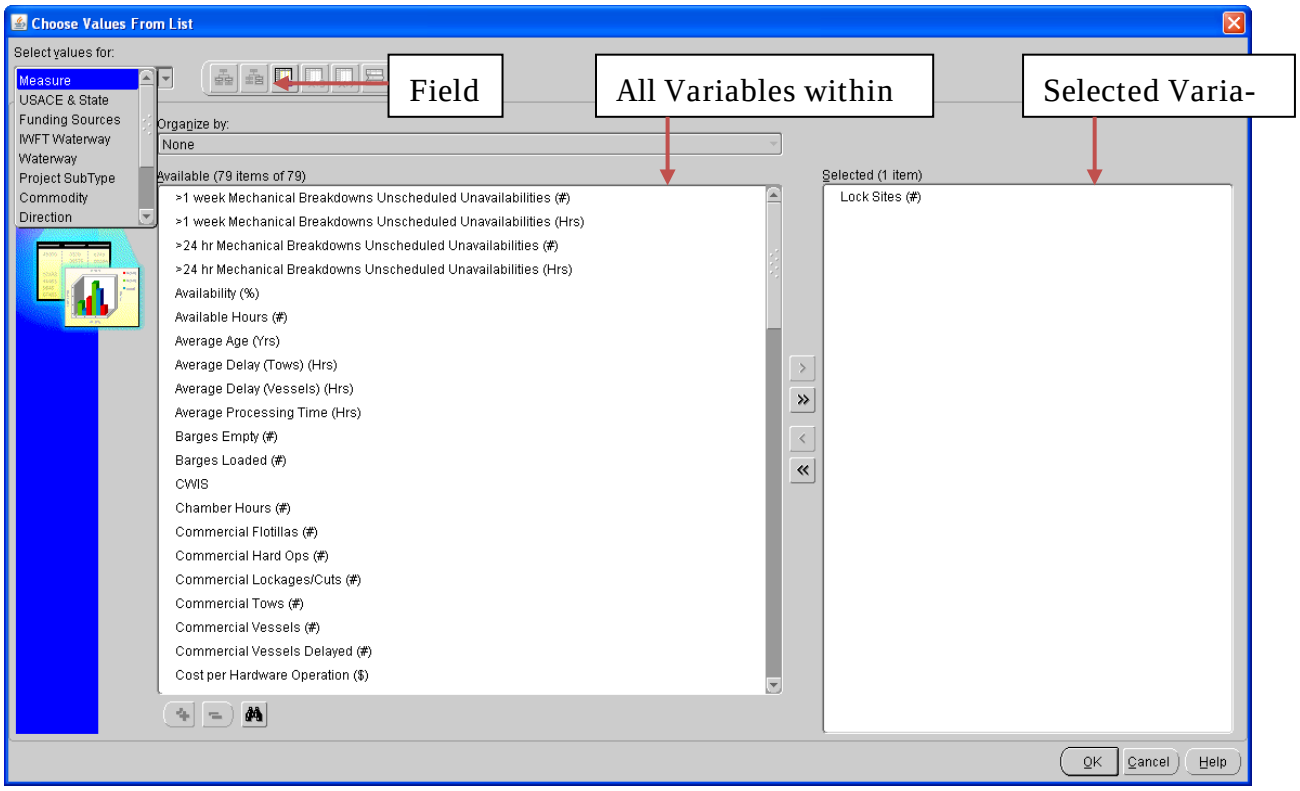
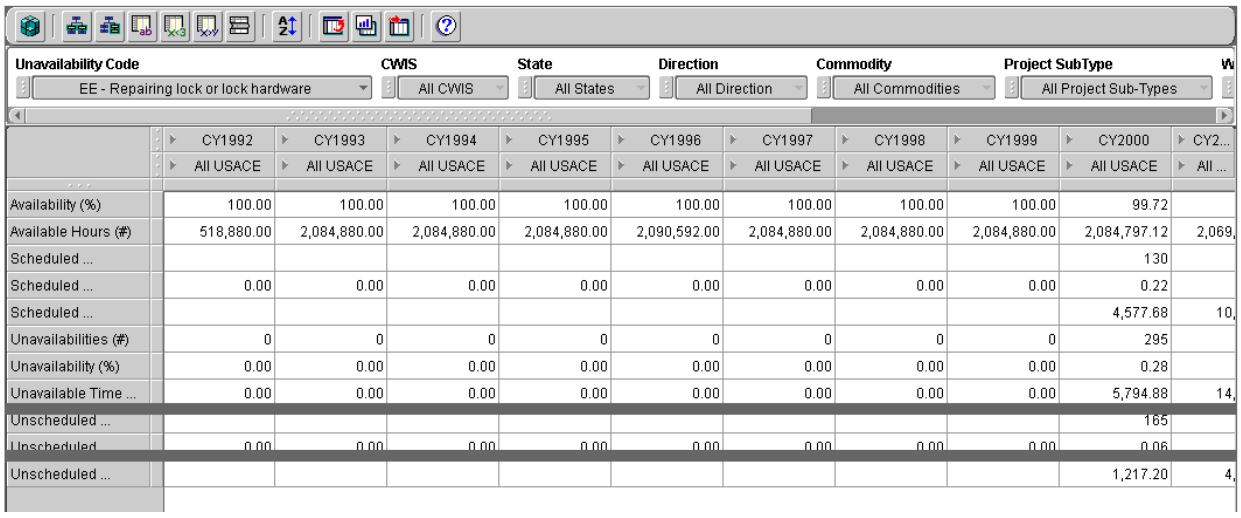


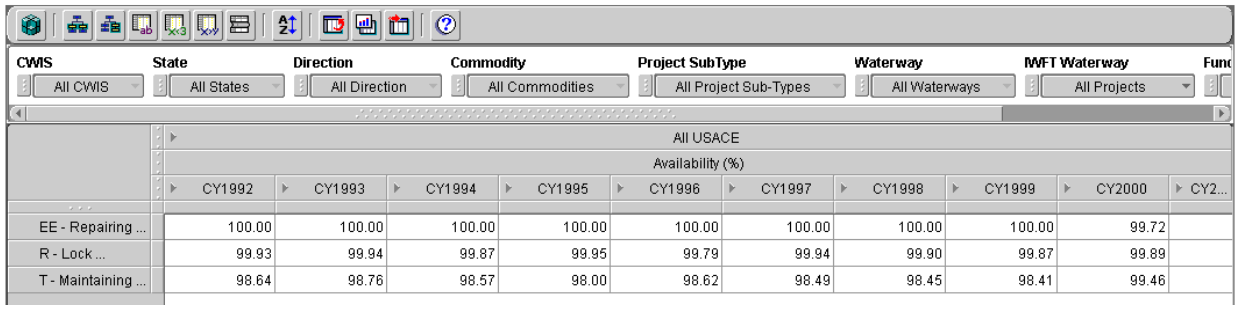
Figure 22. Initial display of data.



Unavailability Code	CWIS	State	Direction	Commodity	Project SubType
EE - Repairing lock or lock hardware	All CWIS	All States	All Direction	All Commodities	All Project Sub-Types

	CY1992	CY1993	CY1994	CY1995	CY1996	CY1997	CY1998	CY1999	CY2000	CY2...
	All USACE	All USACE	All USACE	All USACE	All USACE	All USACE	All USACE	All USACE	All USACE	All ...
Availability (%)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	99.72	
Available Hours (#)	518,880.00	2,084,880.00	2,084,880.00	2,084,880.00	2,090,592.00	2,084,880.00	2,084,880.00	2,084,880.00	2,084,797.12	2,069,
Scheduled ...									130	
Scheduled ...	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22	
Scheduled ...									4,577.68	10,
Unavailabilities (#)	0	0	0	0	0	0	0	0	295	
Unavailability (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28	
Unavailable Time ...	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5,794.88	14,
Unscheduled ...									165	
Unscheduled ...	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	
Unscheduled ...									1,217.20	4,

Figure 23. Adjusted display of data.



CWIS	State	Direction	Commodity	Project SubType	Waterway	MFT Waterway	Func
All CWIS	All States	All Direction	All Commodities	All Project Sub-Types	All Waterways	All Projects	

	All USACE									
	Availability (%)									
	CY1992	CY1993	CY1994	CY1995	CY1996	CY1997	CY1998	CY1999	CY2000	CY2...
EE - Repairing ...	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	99.72	
R - Lock ...	99.93	99.94	99.87	99.95	99.79	99.94	99.90	99.87	99.89	
T - Maintaining ...	98.64	98.76	98.57	98.00	98.62	98.49	98.45	98.41	99.46	

For the years selected, total scheduled unavailable time was 59.1% of total unavailable time among all USACE locks per year, of which 40.9% was unscheduled. The three categories of interest (repairs, maintenance and malfunctions) represent a total of 28.5% of total unavailable time. For the same three categories of interest, 15.0% of unavailable time was scheduled and 13.5% was unscheduled.

The individual percentages for these categories are shown in Figure 24, presenting the unscheduled unavailable time as a percentage of total unavailable time. These yearly percentages range from 1%-14%, and when combined they represent 4%-21% of total unavailable time during the years. Total unavailability for each category, followed by the three categories combined is shown in Figure 25. This chart shows how much of the unavailable time (on average 13.9%) was mostly, due to repairing the lock or lock hardware (category EE), 10.7% to maintaining the lock or lock equipment (category T), and 3.9% to lock hardware or equipment malfunction (category R). When these three categories' unscheduled unavailability is compared to that of the other 26 categories, 33% of all unscheduled unavailability is due to these three categories and 67% to the other 26 categories. Figure 26 presents how the unscheduled unavailability of these three categories compares to the all other unscheduled unavailability each year. Scheduled unavailability for these categories is 25.3% of all scheduled unavailability, whereas all other categories comprise 74.7%. Figure 27 presents how the scheduled unavailability of these three categories compares to the all other scheduled unavailability each year.

Figure 24. Category unscheduled unavailability versus total unavailable.

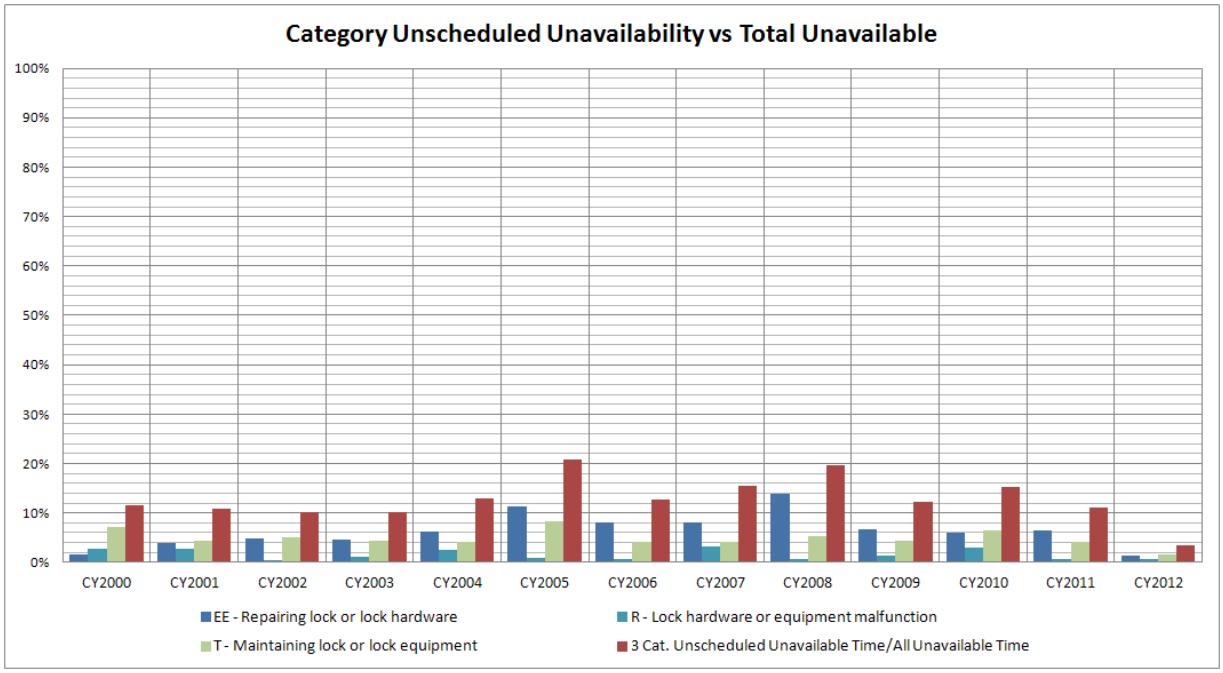


Figure 25. Category unavailability versus total unavailable.

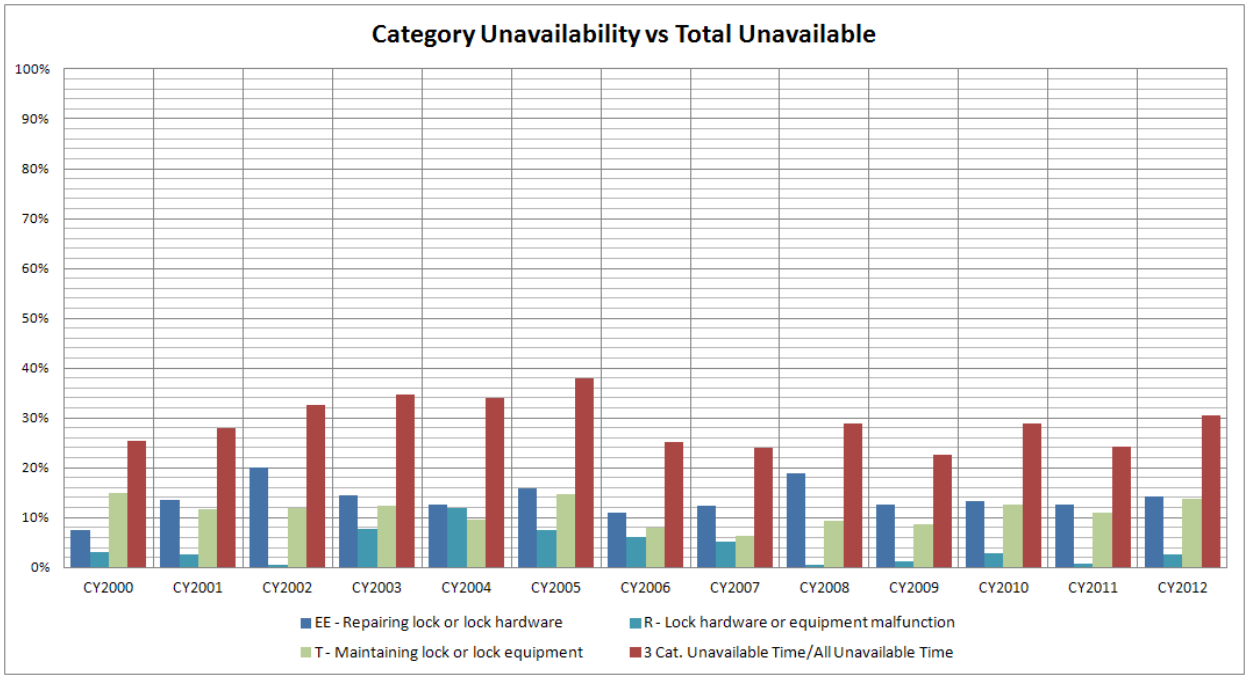


Figure 26. 3 Category unscheduled unavailability and all other unscheduled versus total unavailable.

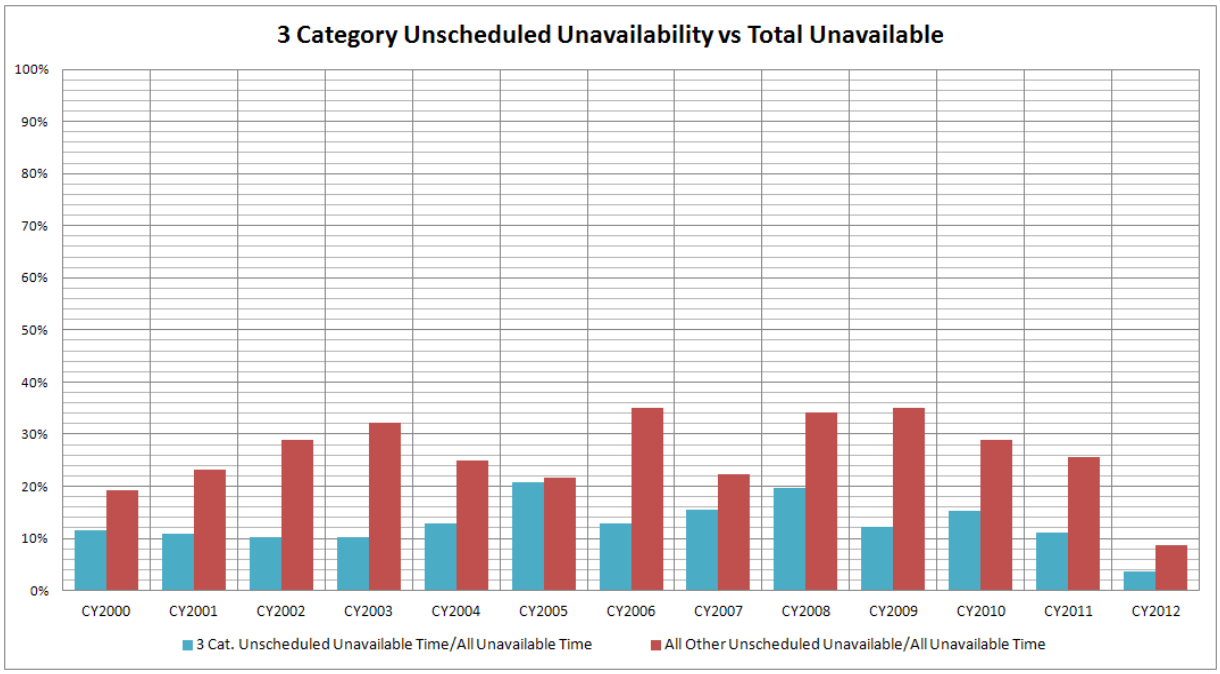
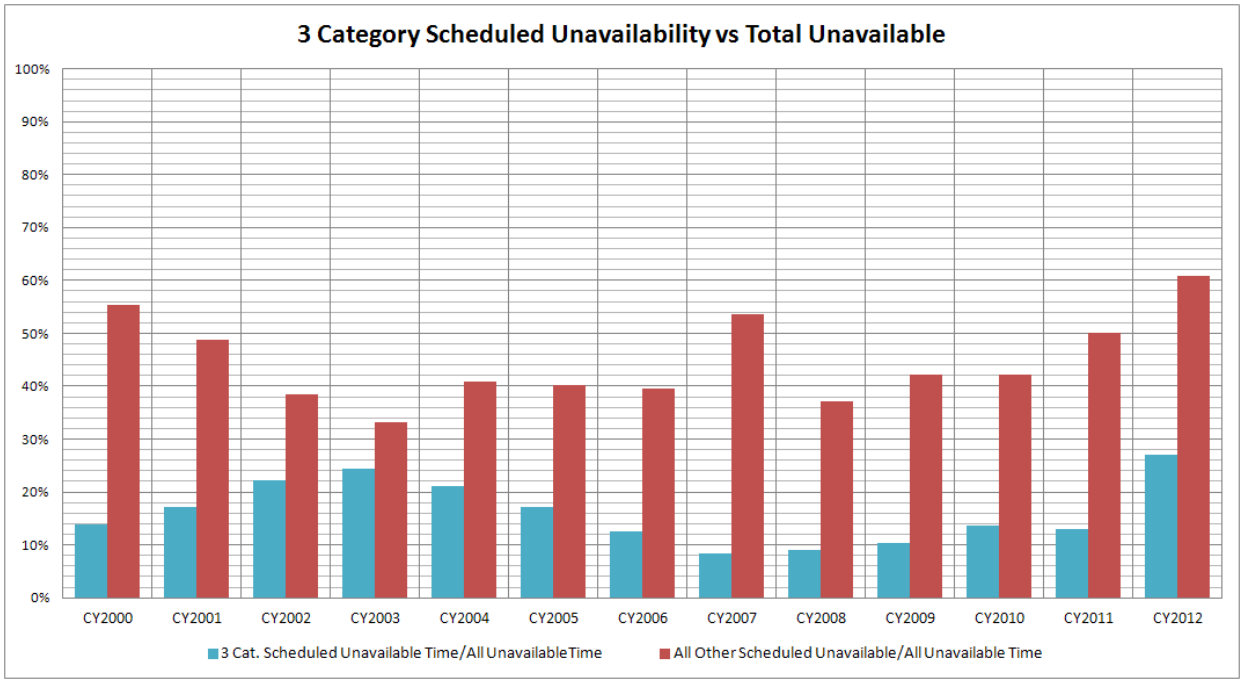


Figure 27. 3 Category scheduled unavailability and all other scheduled versus total unavailable.



Lock closures can be expensive to industry and to the government. Unscheduled closures caused by repairs or maintenance can increase delays and queues, especially if they occur frequently. In order to reduce the amount and length of lock closures, certain closure categories should be studied further. From the data acquired, the three categories of interest comprised a total of 28.5% of unavailable time throughout USACE locks during 2000- Sept. 27, 2012, where 15% of the unavailable time was scheduled and 13.5% was unscheduled. It is therefore recommended to further study the causes of the closures, especially unscheduled as this impacts industry more severely. Unfortunately, detailed information about these closures is unavailable through OMBIL and is not currently available in FEM either.

5.4 Measuring condition

Before discussing how to measure condition, a definition of condition should first be stated. Condition is a state of appearance, quality, or working order. In regards to infrastructure, it typically refers to wear, corrosion, and other forms of deterioration, but the term is also frequently used to refer to various facets of functional readiness.

The two most important considerations affecting the integrity of condition data are the quality of the data that is collected and the degree to which the data is appropriate for the intended use. Because there is no perfect measurement of condition, there are many variables to be considered when trying to quantify the condition of a given piece of infrastructure.

- What kind of data is available or might be collected
- Is a measure of condition, function, or some other metric needed
- Is the condition being used to make strategic (network level) or tactical (project level) decisions.
- Is a measure needed for a failure mode, subcomponent, component, or system
- How accurate must the condition rating be in order to meet the given need for a condition measure
- What is the cost-benefit of creating the condition rating

5.4.1 Condition data and condition categories

The following four categories illustrate different levels of detail for information within a condition rating system. They are listed from most de-

tailed to least. This loss of detail has to be weighed against the cost of more detail and the impact to the end objective of using the condition measurement. Note that greater detail allows more accuracy, but it does not guarantee accuracy. That is determined by the specifics of the rating method.

1. Measurement – Direct measurement is the least subjective and the most repeatable. While measurement values can vary, they are least likely to vary from person to person. Some distresses such as corrosion can be difficult to measure. Others such as noise or vibration are rarely measured. While the correlation may not be directly one to one, measurements are the most likely condition rating to inform about a failure mode.

Examples of measurements are: thickness, length, viscosity, amperage, force, section loss, missing bolts/rivets, leakage rate, piezometric level, number of pits, volume loss, displacement, temperature, etc.

2. Measurement category – Categories might be similar to the actual measurements but measured or recorded within a range. In many cases this would allow the measurement to be "eyeballed" instead of actually measured.

Examples of measurement categories are: within specification, less than 10%, very fine <0.01, fine >0.01 and <0.04, medium >0.04 and <0.08, wide >0.08, less than 2-in. loss, loss exposing rebar.

3. Individualized condition category – While the categories may not include physical measurements, the description of each category is specific to the item and helps create a shared mental image of the types and severity of distresses for the rated item but still more subjective than measurements. Condition category ratings are shown in Table 7.

Table 7. Individual component condition categories.

1	Machinery has failed/ broken teeth or misaligned teeth cause failure.
2	Teeth are worn, gears have backlash and vibrate, lubrication is low.
3	Gears show pitting and oil discolored
4	Minor pitting on gear teeth, but unit functions properly.
5	Machine is in good condition and no misalignment is occurring.

4. Generic condition category – Whether the categories are defined (e.g., excellent, good, fair, poor, failed), or the categories include more explana-

tion, the same categories are applied to all rated items. It is likely that people will have varying images of both the types and the severity of the distresses present. Examples of generic condition categories are shown in Table 8.

Table 8 - Generic condition rating scale.

Zone	Condition Index	Condition Description
1	85 to 100	**Excellent:** No noticeable defects. Some aging or wear may be visible.
	70 to 84	**Good:** Only minor deterioration or defects are evident.
2	55 to 69	**Fair:** Some deterioration or defects are evident, but function is not significantly affected.
	40 to 54	**Marginal:** Moderate deterioration. Function is still adequate.
3	25 to 39	**Poor:** Serious deterioration in at least some portions of the structure. Function is inadequate.
	10 to 24	**Very poor:** Extensive deterioration. Barely functional.
	0 to 9	**Failed:** No longer functions. General failure or complete failure or a major structural component.

5.4.2 Condition category inaccuracies

Categories also introduce another problem to data quality beside the loss of detail. They often capture information lacking either the appropriate accuracy or applicability to the question or decision to be addressed.

Ambiguous categories

Categories can also be ambiguous if they contain multiple conditions. Referring to the individualized condition categories of Table 7, we note that the categories contain multiple distresses or deficiencies. In both of these examples, the specific condition present is unknown. Teeth wear, lubrication level, and vibration may be related but all can occur separately or in any combination. These condition descriptions also lack an indication of severity.

- "Teeth are worn, gears have backlash and vibrate, lubrication is low"
  - Wear, backlash, vibration, and lubrication are all correlated but each can occur independently.
  - How worn? How much vibration and backlash? How low?

- "Serious deterioration in at least some portions of the structure. Function is inadequate."
  - Deterioration and function are correlated but are more likely to be independent for most of the life cycle.
  - How serious? Which portion?

Non-condition categories

"Condition" tends to be a catchall for many things that aren't strictly condition. There is nothing wrong with this as long as there is a shared understanding of what is meant. While Table 8 is primarily a generic condition rating scale, it is ambiguous because it includes functionality as part of the condition category description. Another example of non-condition condition rate categories is shown in Table 9. These categories are based on judgment of confidence in future performance. They are reliability or dependability ratings. Note that it is unclear how moderate and high level of confidence should be defined. While condition often indicates wear, usage, or deterioration, reliability ratings might show low ratings for new items of poor quality or for items that frequently break down for reasons other than condition such as overload. If these reliability ratings are used where condition information is really needed, results are likely to be poor.

Table 9. Expected performance categories

1	Judged to have high likelihood of failure when needed with high level of confidence.
2	Judged to not likely perform satisfactorily when needed with a moderate level of confidence.
3	Moderate rating.
4	Judged to likely perform satisfactorily when needed with a moderate level of confidence.
5	Judged to perform well when needed with a high level of confidence.

5.4.3 Applying condition ratings to asset hierarchical levels

Condition ratings may also have different benefits depending on whether the rating is for a failure mode, a system, or some hierarchical level between. Using a condition rating made at one level for a decision at a different level of the asset hierarchy typically results in a poor outcome.

Condition ratings at different levels and the type of inspection needed are given below:

- Condition rating of the system (visual or performance)
- Condition rating of the component (visual)
- Condition rating of the component (visual, measurement, and performance)
- Condition rating of the subcomponent (visual, measurement, and performance)
- Condition rating of the failure mode (visual, measurement, and performance)

The value of the condition rating data may vary depending on whether it is based on visual observation, measurements, or performance. Performance ratings are often referred to as functional ratings.

5.5 Operational condition assessment

At the start of this project, it was requested that OCA ratings be used as the measure of condition. As previously discussed, condition ratings can capture different aspects of condition with varying degrees of accuracy. The primary use of navigation OCA ratings is to assess the probability of an unscheduled lock shutdown due to infrastructure unavailability. This does not necessarily align with the condition as it relates to maintenance effectiveness so it is reasonable to analyze whether the condition measures are appropriate for assessing maintenance effectiveness.

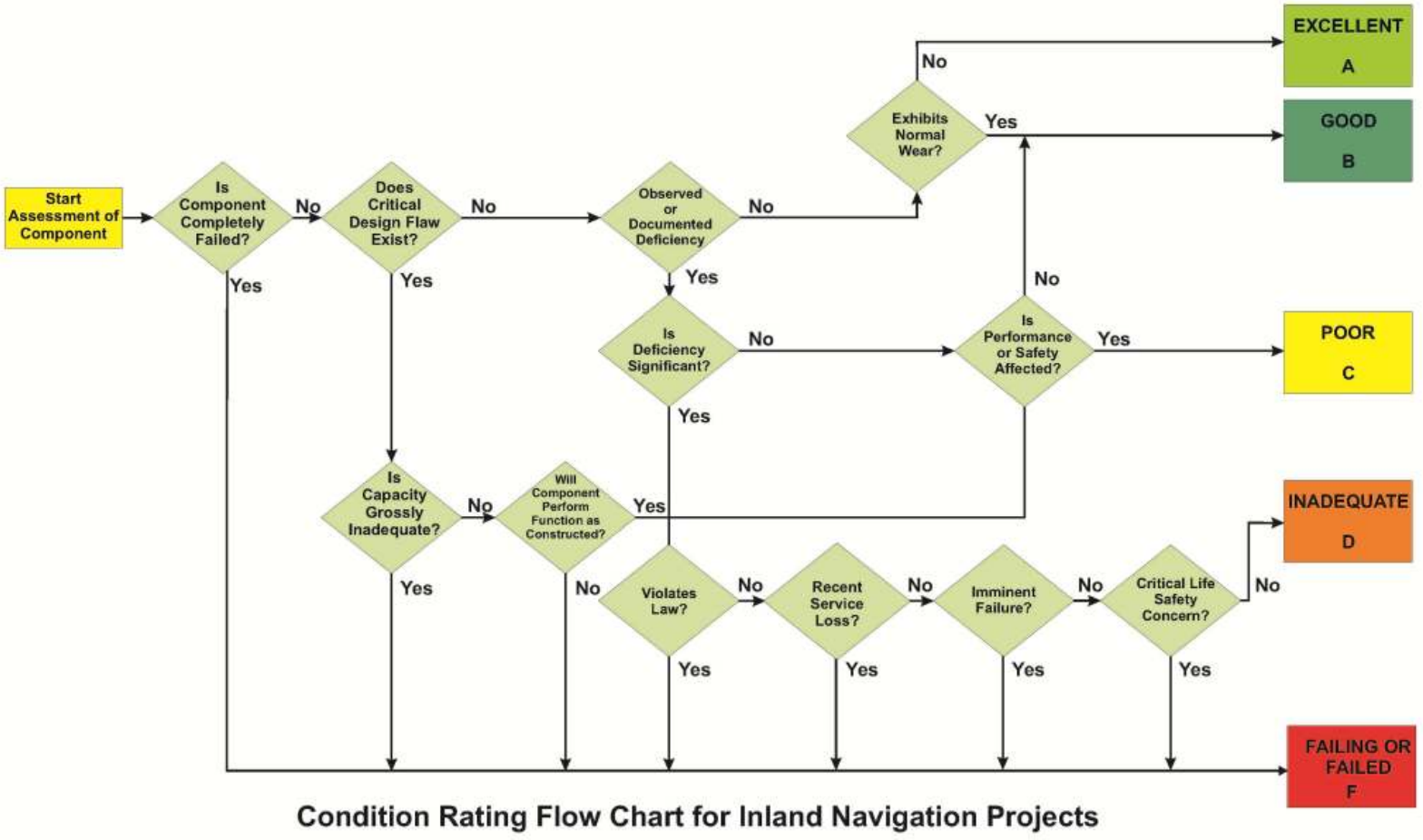
The OCA navigation condition rating flowchart in Figure 28 shows the rating methodology. It is based on a series of yes/no questions resulting in five possible ratings. A review of the criteria for assigning these OCA ratings suggests, however, that they do not provide a meaningful measure of condition as it would relate to maintenance. Reasons for the lack of meaningful measure are given below.

- The OCA questions include numerous factors unrelated to maintenance (e.g., violates law, life safety concern, capacity, design flaw), and the measures of condition related to maintenance (normal wear) and potentially related to maintenance (e.g., imminent failure, recent service loss, known deficiency).
- The ratings are not only noncontinuous, but the discrete ratings also are based on yes/no measures that provide only a minimal number of

gradations. These yes/no questions do not provide sufficient detail to relate the condition to maintenance practices.

- The ratings are applied at a component or sub-system level. Information for judging maintenance effectiveness is more useful at the subcomponent of failure mode level.

Figure 28. OCA navigation condition rating flowchart (USACE n.p.).



6 Summary

6.1 Conclusion

The primary objective of this project was not met. Early in the project, it was learned that the maintenance records in FEM lacked the detail and specificity to complete the primary tasks assigned to this work. It was also clear that the OCA ratings did not capture appropriate information for assessing maintenance effectiveness. Nonetheless, this project resulted in many valuable findings that can be applied to improve effectiveness within USACE Civil Works O&M maintenance management.

One of the major findings was that a focus on prioritizing repairs based on risk of unscheduled outage results in conflicting priorities, with standard maintenance management practices focused on minimizing overall maintenance costs and as a result, likely reducing overall system condition. It is unlikely that asset availability can be optimized directly, based on the priority of individual work packages. Instead, it is reached by a properly balanced application of preventive and corrective maintenance.

6.1.1 Maintenance Effectiveness Review

A MER was held at New Cumberland Lock and Dam. Based on a preliminary review of job plans for a number of projects, the in-depth revision of the job plans at New Cumberland confirms the benefits of creating accurate job plans and PM schedules. Such revisions come with a significant cost if applied Corps-wide, however; this cost needs to be considered in conjunction with the overall AM objectives and the reasons for using FEM.

6.1.2 Condition rating

At the start of this project, it was requested that OCA ratings be used as the measure of component condition. OCA ratings also are being used as one input for estimating user impacts. While no literature is known to verify the effectiveness for the second use, a review of the criteria for assigning these ratings suggests that OCA ratings do not provide a meaningful measure of condition as it would relate to maintenance. OCA ratings include numerous factors unrelated to maintenance (e.g., violates law, life safety concern, capacity, design flaw) and the measures of condition related to maintenance (e.g., normal wear) and potentially related to mainte-

nance (e.g., imminent failure, recent service loss, known deficiency) not only are noncontinuous, but also the discrete ratings are based on yes/no measures that provide minimal information regarding deterioration or indication of maintenance effectiveness.

6.1.3 FEM

Currently FEM records contain inventory information of varying detail, job plans, PM schedules, and records of completed scheduled maintenance. Some USACE districts and projects use FEM for additional records such as standing work orders, gauge monitoring, labor reporting, and inventory, but these uses are limited. In these capacities, FEM is primarily being used as a glorified calendar and spreadsheet. Far more thought and development needs to be applied to FEM if USACE is to capture more than a small fraction of this maintenance system's potential benefits.

6.2 Recommendations

In order to judge the effectiveness of maintenance applied to USACE navigation locks, as well as other USACE infrastructure, there is a need for substantial additional capabilities. These capabilities are mostly or entirely inherent in use of FEM at a level that captures most of the tools benefits. In other words, if USACE intends to continue using FEM, these are capabilities that should be implemented and used.

In addition to the suggestions for collection of data in FEM listed in the subsequent sub-section, there is also an opportunity to collect data on preventative and corrective maintenance in order to better understand how this ration relates to failures and downtime as discussed in Section 4.3. It would be a substantial effort to develop this capability and collect the data.

6.2.1 Facility Equipment Maintenance

Whether maintenance management information of various types is currently being entered into FEM, could be entered but is not, or can't currently be recorded in FEM, there needs to be a well-developed plan for how this information is going to be used, how it will benefit the Corps, how it is going to be ensured that the information is entered, and how it will be reviewed for accuracy.

The following items currently in FEM that the owners should review and revise:

- Job plans
- Asset hierarchies
- Classifications

USACE currently has job plans in FEM for most scheduled maintenance. The job plan tasks need to be more completely documented and revised for clarity.

The following items can currently be entered in FEM but are generally not entered. There should be additional guidance developed at the national level to increase uniformity within and across projects and also to determine what data will best meet needs at local and national levels:

- Labor
- Materials and costs
- Inventory

Significant resistance to labor reporting within FEM was noted during the work documented in this report. It is unclear why such resistance is present as it could be accomplished with little or no additional effort. It is primarily a matter of changing a business practice. The benefits of accurately reporting labor within FEM to evaluating maintenance practices are significant.

Assessing the benefits of using inventory capabilities within FEM is beyond the scope of this report but it should be explicitly considered at the USACE level.

The following items that can be entered in FEM but some have no standardized input to ensure uniformity. They should be reviewed and revised at the national level. There is a need to not only ensure uniformity and consistency, but also to determine what data will best meet needs at local and national levels:

- Classifications
- Attributes
- Failure reporting

- Downtime reporting
- Condition monitoring
- Asset prioritization
- Work order prioritization

Asset classification capabilities currently implemented within FEM are inadequate for effective use of the data collected on maintenance practices. Insufficient asset classification is an obstacle to effective searches of the collected information.

Attributes also need to be established within FEM for many of the same reasons as classifications. Attributes enhance the capabilities provided by a robust classification system.

USACE capabilities for estimating risk associated with infrastructure availability are severely limited by a lack of data useful in estimating probabilities of adverse conditions. Only minimal improvements can be made unless the right data is systematically collected on component failures, operational failures, and other causes of infrastructure unavailability. Useful data collection can only be accomplished through a very careful consideration of what data will be most likely to predict probabilities of failures and downtime.

Reporting of condition monitoring data in FEM can provide multiple benefits but one in particular is as supporting data for understanding the causes of failures and estimating failures.

Work order and asset prioritization may provide benefits to AM beyond assessing maintenance effectiveness, and their value and usage should be investigated further. While it may currently be too early in the development of the USACE AM program, these tools should be considered within an overall plan and not ignored until the program matures.

6.2.2 Condition rating

If the original objective of this project—using condition as a measure of maintenance effectiveness—remains attractive, it can only be accomplished by using condition ratings at a sub-component or failure mode level. In the development of these ratings, one step should be to assess the desirability of developing ratings at each of those two levels.

Whether OCA is a useful tool for asset management generally, and more specifically for budget prioritization, is a question that was not addressed in this report but appears to be worth further investigation.

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Appendix A: FEM Component Classifications

The first page is the first-level classification structure, and the subsequent four pages comprise the lock components classification.

FEM Classification Structure		
		ER 37-1-30 Chp 14 App A
01	Not Used	Lands and Damages
02	Not Used	Relocators
03	Reservoirs	Reservoirs
04	Dam	Dam
05	Lock	Lock
06	Fish and Wildlife Facility	Fish and Wildlife Facility
07	Power Plant	Power Plant
08	Roads, Railroads, and Bridges	Roads, Railroads, and Bridges
09	Channels and Canals	Channels and Canals
10	Breakwaters and Seawalls	Breakwaters and Seawalls
11	Levees and Floodwalls	Levees and Floodwalls
12	Coastal Navigation Ports and Harbors	Coastal Navigation Ports and Harbors
13	Pumping Plants	Pumping Plants
14	Recreational Facilities	Recreational Area
15	Floodway Control and Diversion Structures	Floodway Control and Diversion Structures
16	Bank Stabilization	Bank Stabilization
17	Not Used	Beach Replenishment
18	Not Used	Cultural Resources
19	Buildings, Grounds and Utilities	Buildings, Grounds and Utilities
20	Permanent Operating Equipment (Fleet)	Permanent Operating Equipment (Fleet)
		* Blue Sections not included in current ER but are included in "Real Property Cost Feature Definitions"

ER 37-1-30			Asset Classification				Notes
05 LOCKS			05			Lock	
	1. Basic Lock Features			05-00-01		Lock, Basic Lock Features	
		a. Structure, excluding Timber Structures			05-00-01-01	Lock, Basic Lock Features, Structure	
						Lock, Basic Lock Features, Structurs, Lock Walls	
						Lock Sills and Floors	
						Lock Cutoff Walls	
						Lock Embankments	
						Lock Erosion Protection	
						Lock Other Structural Systems	
		b. Gates			05-00-01-02	Lock, Basic Lock Features, Lock Gate	Attributes: miter, lift, sector, tainter, roller
		c. Machinery, Gate Operating			05-00-01-03	Lock, Basic Lock Features, Lock Gate Operating Machinery	
		d. Control House, separate from Lock Structure					Not Used, recommending 19 - Buildings and Utilities
		e. Operating Building, Concrete					Not Used, recommending 19 - Buildings and Utilities
		f. Water System			05-00-01-06	Lock, Basic Lock Features, Water System	
		g. Sewer System			05-00-01-07	Lock, Basic Lock Features, Sewer System	
		h. Heating and/or Ventilating System			05-00-01-08	Lock, Basic Lock Features, HVAC System	
		i. Filling and Emptying Valves and Operating Equipment			05-00-01-09	Lock, Basic Lock Features, Filling and Emptying Valves and Operating Equipment	
		j. Lighting System, excluding Lighting Board and Attached Accessory Equipment			05-00-01-10	Lock, Basic Lock Features, Lighting System	

		l. Main Power System, excluding Power Boards and Engine Generator Sets 100-kw and over			05-00-01-12	Lock, Basic Lock Features, Main Power System	
		m. Stoplogs and Bulkheads			05-00-01-13	Lock, Basic Lock Features, Stoplogs and Bulkheads	
		n. Crane, Complete (excluding Mobile and Crawler type)			05-00-01-14	Lock, Basic Lock Features, Crane	* Suggested addition to 20
		o. All Components not listed elsewhere			05-00-01-15	Lock, Basic Lock Features, All other Components	
	2. Operating Buildings, other than Concrete, not part of Lock Structure, excluding Control Houses.						Not Used, recommending 19 - Buildings and Utilities
	3. Radio towers, 80 feet and over			05-00-03		Lock, Radio towers, 80 feet and over	
	4. Elevator, complete, with Operating Mechanism, excluding embedded parts			05-00-04		Lock, Elevator	
	5. 055 Engine Generator Set, 100-kw and over			05-00-05		Lock, Engine Generator Set > 100kW	

	6. 056 Main Power, Lighting and Control Boards, complete with attached accessories			05-00-06		Lock, Power, Lighting, and Control Boards	
	7. Air Compressors, complete, 100 cfm and over			05-00-07		Lock, Air Compressors > 100 cfm	
	8. Moorage and Lock Approach Structures Guide Walls, Dolphins and other Guide Structures, timber			05-00-08		Lock, Moorage and Lock Approach Structures	
		a. Mooring Dolphins and other Facilities for Temporary Moorage Water-borne Traffic			05-00-08-01	Lock, Moorage and Lock Approach Structures, Mooring Dolphins & Other Facilities for Temporary Moorage	
		b. Bulkheads and retaining Walls			05-00-08-02	Lock, Moorage and Lock Approach Structures, Bulkheads and Retaining Walls	
	9. Roof Coverings, 3,000 sq. ft. and over per building						Not Used

	10. Radio communications equipment location including transmitter, receiver power supplies, auxiliary generators, batteries, cables, and antennas, but excluding land and improvements, buildings, and tower 80 feet and over						Not Used, Recommend adding to 20

Appendix B: FEM Component Hierarchy Examples

This Appendix includes the hierarchies entered into FEM for Wilson Lock and Dam (H3WILL) and Lower Monumental Locks and Dam (G4-3N).

B.1. Wilson Lock and Dam

- WIL Lock (H3WILL)
  - WIL Lock, Primary Lock Chamber 01 (H3WILL01)
    - WIL Lock, Primary Lock Chamber Gates (H3WILL01G)
      - WIL Lock, Primary Lock Chamber Gates, Lift (H3WILL01GL)
      - WIL Lock, Gates, Lift, Upstream, Primary Chamber (H3WILL01GLU)
      - WIL Lock, Primary Lock Chamber Gates, Miter (H3WILL01GM)
        - WIL Lock, Gates, Miter, Downstream, Primary Chamber (H3WILL01GMD)
      - WIL Lock, Gates, Other Items, Air Bubbler System, Primary Chamber (H3WILL01GOB)
      - WIL Lock, Gates, Other Items, Embedded Metals, Primary Chamber (H3WILL01GOM)
      - WIL Lock, Gates, Other Items, Seals, Primary Chamber (H3WILL01GOS)
      - WIL Lock, Gates, Operating Equip & Mach, Downstream, Primary Chamber (H3WILL01GQD)
      - WIL Lock, Gates, Operating Equip & Mach, Upstream, Primary Chamber (H3WILL01GQU)
    - WIL Lock, Primary Lock Chamber Structure (H3WILL01S)
      - WIL Lock, Structures, Erosion Protection, Downstream Approach, Primary Chamber (H3WILL01SEPD)
      - WIL Lock, Structures, Erosion Protection, Upstream Approach, Primary Chamber (H3WILL01SEPU)
      - WIL Lock, Structures, Floor System, Primary Chamber (H3WILL01SFF)
      - WIL Lock, Structures, Guard Sill, Downstream, Primary Chamber (H3WILL01SFGD)
      - WIL Lock, Structures, Guard Sill, Upstream, Primary Chamber (H3WILL01SFGU)
      - WIL Lock, Structures, Miter Sill, Downstream, Primary Chamber (H3WILL01SFMD)
      - WIL Lock, Structures, Miter Sill, Upstream, Primary Chamber (H3WILL01SFMU)
      - WIL Lock, Structures, Navigation Aides, Floating Mooring Bits, Primary Chamber (H3WILL01SNF)
      - WIL Lock, Structures, Navigation Aides, Tow Haulage Systems, Primary Chamber (H3WILL01SNT)
      - WIL Lock, Primary Lock Chamber Structures, Lock Walls (H3WILL01SW)
        - WIL Lock, Structures, Lock Walls, Lower Guide Wall, Primary Chamber (H3WILL01SWDD)
        - WIL Lock, Structures, Lock Walls, Land Wall, Primary Chamber (H3WILL01SWL)
        - WIL Lock, Structures, Lock Walls, River Wall, Primary Chamber (H3WILL01SWR)
        - WIL Lock, Structures, Lock Walls, Upper Guide Wall, Primary Chamber (H3WILL01SWUD)
    - WIL Lock, Primary Lock Chamber Valves (H3WILL01V)
      - WIL Lock, Primary Lock Chamber Valves, Operating Machinery (H3WILL01VM)
        - WIL Lock, Valves, Operating Machinery, Emptying Valve, Land Wall, Primary Chamber (H3WILL01VMEL)
        - WIL Lock, Valves, Operating Machinery, Emptying Valve, River Wall, Primary Chamber (H3WILL01VMER)
        - WIL Lock, Valves, Operating Machinery, Filling Valve, Land Wall, Primary Chamber (H3WILL01VMFL)
        - WIL Lock, Valves, Operating Machinery, Filling Valve, River Wall, Primary Chamber (H3WILL01VMFR)
        - WIL Lock, Valves, Operating Machinery, Supplemental Emptying Valve, Land Wall, Primary Chamber (H3WILL01VMSEL)
      - WIL Lock, Primary Lock Chamber Valves, Other Items (H3WILL01VO)
        - WIL Lock, Valves, Other Items, Debris Guards, Intakes, Primary Chamber (H3WILL01VOIG)
        - WIL Lock, Valves, Other Items, Embedded Metals, Emptying Valves, Land Wall, Primary Chamber (H3WILL01VOMEL)
        - WIL Lock, Valves, Other Items, Embedded Metals, Emptying Valves, River Wall, Primary Chamber (H3WILL01VOMER)
        - WIL Lock, Valves, Other Items, Embedded Metals, Filling Valves, Land Wall, Primary Chamber (H3WILL01VOMFL)
        - WIL Lock, Valves, Other Items, Embedded Metals, Filling Valves, River Wall, Primary Chamber (H3WILL01VOMFR)

- WIL Lock, Valves, Other Items, Seals, Emptying Valves, Land Wall, Primary Chamber (H3WILL01VOSEL)
- WIL Lock, Valves, Other Items, Seals, Emptying Valves, River Wall, Primary Chamber (H3WILL01VOSER)
- WIL Lock, Valves, Other Items, Seals, Filling Valves, River Wall, Primary Chamber (H3WILL01VOSFR)

WIL Lock, Auxiliary Lock Chamber 02 (H3WILL02)

- WIL Lock, Auxiliary Lock Chamber Gates (H3WILL02G)
  - WIL Lock, Auxiliary Lock Chamber Gates, Lift (H3WILL02GL)
  - WIL Lock, Gates, Lift, Upstream, Auxiliary Chamber (H3WILL02GLU)
  - WIL Lock, Auxiliary Lock Chamber Gates, Miter (H3WILL02GM)
    - WIL Lock, Gates, Miter, Downstream, Auxiliary Chamber (H3WILL02GMD)
    - WIL Lock, Gates, Miter, Middle, Auxiliary Chamber (H3WILL02GMM)
  - WIL Lock, Gates, Other Items, Air Bubbler System, Auxiliary Chamber (H3WILL02GOB)
  - WIL Lock, Gates, Other Items, Embedded Metals, Auxiliary Chamber (H3WILL02GOM)
  - WIL Lock, Gates, Other Items, Seals, Auxiliary Chamber (H3WILL02GOS)
  - WIL Lock, Gates, Operating Equip & Mach, Downstream, Auxiliary Chamber (H3WILL02GQD)
  - WIL Lock, Gates, Operating Equip & Mach, Middle, Auxiliary Chamber (H3WILL02GQM)
  - WIL Lock, Gates, Operating Equip & Mach, Upstream, Auxiliary Chamber (H3WILL02GQU)
- WIL Lock, Auxiliary Lock Chamber Structure (H3WILL02S)
  - WIL Lock, Structures, Erosion Protection, Downstream Approach, Auxiliary Chamber (H3WILL02SEPD)
  - WIL Lock, Structures, Erosion Protection, Upstream Approach, Auxiliary Chamber (H3WILL02SEPU)
  - WIL Lock, Structures, Floor System, Auxiliary Chamber (H3WILL02SFF)
  - WIL Lock, Structures, Guard Sill, Downstream, Auxiliary Chamber (H3WILL02SFGD)
  - WIL Lock, Structures, Guard Sill, Middle, Auxiliary Chamber (H3WILL02SFGM)
  - WIL Lock, Structures, Guard Sill, Upstream, Auxiliary Chamber (H3WILL02SFGU)
  - WIL Lock, Structures, Miter Sill, Downstream, Auxiliary Chamber (H3WILL02SFMD)
  - WIL Lock, Structures, Miter Sill, Middle, Auxiliary Chamber (H3WILL02SFMM)
  - WIL Lock, Structures, Miter Sill, Upstream, Auxiliary Chamber (H3WILL02SFMU)
  - WIL Lock, Structures, Navigation Aides, Floating Mooring Bits, Auxiliary Chamber (H3WILL02SNF)
  - WIL Lock, Structures, Navigation Aides, Tow Haulage Systems, Auxiliary Chamber (H3WILL02SNT)
  - WIL Lock, Auxiliary Lock Chamber Structures, Lock Walls (H3WILL02SW)
    - WIL Lock, Structures, Lock Walls, Lower Guard Wall, Auxiliary Chamber (H3WILL02SWDR)
    - WIL Lock, Structures, Lock Walls, Land Wall, Auxiliary Chamber (H3WILL02SWL)
    - WIL Lock, Structures, Lock Walls, River Wall, Auxiliary Chamber (H3WILL02SWR)
    - WIL Lock, Structures, Lock Walls, Upper Guard Wall, Auxiliary Chamber (H3WILL02SWUR)
- WIL Lock, Auxiliary Lock Chamber Valves (H3WILL02V)
  - WIL Lock, Auxiliary Lock Chamber Valves, Operating Machinery (H3WILL02VM)
    - WIL Lock, Valves, Operating Machinery, Emptying Valve, Land Wall, Auxiliary Chamber (H3WILL02VMEL)
    - WIL Lock, Valves, Operating Machinery, Emptying Valve, River Wall, Auxiliary Chamber, Lower (H3WILL02VMERL)
    - WIL Lock, Valves, Operating Machinery, Emptying Valve, River Wall, Auxiliary Chamber, Upper (H3WILL02VMERU)
    - WIL Lock, Valves, Operating Machinery, Filling Valve, Land Wall, Auxiliary Chamber, Upper (H3WILL02VMFLU)
    - WIL Lock, Valves, Operating Machinery, Filling Valve, River Wall, Auxiliary Chamber, Upper (H3WILL02VMFRU)

- WIL Lock, Auxiliary Lock Chamber Valves, Other Items (H3WILL02VO)
  - WIL Lock, Valves, Other Items, Debris Guards, Intakes, Auxiliary Chamber (H3WILL02VOIG)
  - WIL Lock, Valves, Other Items, Embedded Metals, Emptying Valves, Land Wall, Auxiliary Chamber (H3WILL02VOMEL)
  - WIL Lock, Valves, Other Items, Embedded Metals, Emptying Valves, River Wall, Auxiliary Chamber (H3WILL02VOMER)
  - WIL Lock, Valves, Other Items, Embedded Metals, Filling Valves, Land Wall, Auxiliary Chamber (H3WILL02VOMFL)
  - WIL Lock, Valves, Other Items, Embedded Metals, Filling Valves, River Wall, Auxiliary Chamber (H3WILL02VOMFR)
  - WIL Lock, Valves, Other Items, Seals, Emptying Valves, Land Wall, Auxiliary Chamber (H3WILL02VOSEL)
  - WIL Lock, Valves, Other Items, Seals, Emptying Valves, River Wall, Auxiliary Chamber (H3WILL02VOSER)
  - WIL Lock, Valves, Other Items, Seals, Filling Valves, River Wall, Auxiliary Chamber (H3WILL02VOSFR)
- WIL Lock, Electronic Security System (H3WILLESS)
- WIL Lock, Gates (H3WILLG)
  - WIL Lock, Gates, Lift (H3WILLGL)
  - WIL Lock, Gates, Miter (H3WILLGM)
  - WIL Lock, Gates, Other Items (H3WILLGO)
  - WIL Lock, Gates, Operating Equipment & Machinery (H3WILLGQ)
- WIL Lock, Instrumentation (H3WILLI)
  - WIL Lock, Instrumentation, Communication & Warning Systems (H3WILLIC)
  - WIL Lock, Instrumentation, Concrete Strain Gages (H3WILLICS)
  - WIL Lock, Instrumentation, Data Management Systems (H3WILLID)
  - WIL Lock, Instrumentation, Inclinometers (H3WILLII)
  - WIL Lock, Instrumentation, Data Loggers (H3WILLIL)
  - WIL Lock, Instrumentation, Alignment Monuments (H3WILLIM)
  - WIL Lock, Instrumentation, Piezometers (H3WILLIP)
  - WIL Lock, Instrumentation, PLCs (H3WILLIPLC)
  - WIL Lock, Instrumentation, Steel Strain Gages (H3WILLISS)
  - WIL Lock, Instrumentation, VFDs (H3WILLIV)
- WIL Lock, Miscellaneous Systems (H3WILLMS)
  - WIL Lock, Miscellaneous Systems, Elevator (H3WILLMSE)
    - WIL Lock, Miscellaneous Systems, Elevator, Cars And Equipment (H3WILLMSECE)
    - WIL Lock, Miscellaneous Systems, Elevator, Power And Controls (H3WILLMSEPC)
- WIL Lock, Other Structures (H3WILLO)
  - WIL Lock, Other Structures, Bridges (H3WILLOB)
    - WIL Lock, Other Structures, Bridges, Service, Superstructure (H3WILLOBSS)
    - WIL Lock, Other Structures, Bridges, Service, Piers, Supports & Foundations (H3WILLOBSU)
  - WIL Lock, Other Structures, Control Buildings (H3WILLOC)
    - WIL Lock, Other Structures, Control Buildings, Land Wall, Primary Chamber (H3WILL01OCBL)
    - WIL Lock, Other Structures, Control Buildings, River Wall, Primary Chamber (H3WILL01OCBR)
    - WIL Lock, Other Structures, Control Buildings, Land Wall, Auxiliary Chamber (H3WILL02OCBL)
    - WIL Lock, Other Structures, Control Buildings, River Wall, Auxiliary Chamber (H3WILL02OCBR)
- WIL Lock, Structures (H3WILLS)
  - WIL Lock, Structures, Embankments (H3WILLSE)
    - WIL Lock, Structures, Embankments, Downstream Approach (H3WILLSED)
    - WIL Lock, Structures, Embankments, Upstream Approach (H3WILLSEU)
  - WIL Lock, Structures, Erosion Protection (H3WILLSEP)
    - WIL Lock, Structures, Erosion Protection, Downstream, Landside Embankment (H3WILLSEPDLE)
    - WIL Lock, Structures, Erosion Protection, Downstream, River Wall (H3WILLSEPDR)
    - WIL Lock, Structures, Erosion Protection, Upstream, Landside Embankment (H3WILLSEPULE)
  - WIL Lock, Structures, Sills & Floors (H3WILLSF)

- WIL Lock, Structures, Navigation Aides (H3WILLSN)
- WIL Lock, Structures, Other Structural Systems (H3WILLSO)
  - WIL Lock, Structures, Other Structural Systems, Retaining Walls (H3WILLSOR)
- WIL Lock, Structures, Lock Walls (H3WILLSW)

- WIL Lock, Utility Systems (H3WILLU)
  - WIL Lock, Utility Systems, Air System (H3WILLUA)
    - WIL Lock, Utility Systems, Air System, Controls (H3WILLUAAC)
    - WIL Lock, Utility Systems, Air System, Distribution System (H3WILLUAAD)
    - WIL Lock, Utility Systems, Air System, Pumps, Valves & Receivers (H3WILLUAAP)
  - WIL Lock, Utility Systems, Electrical Power & Controls (H3WILLUE)
    - WIL Lock, Utility Systems, Electrical Power & Controls, Control Systems (H3WILLUECS)
    - WIL Lock, Utility Systems, Electrical Power & Controls, Distribution Systems (H3WILLUED)
    - WIL Lock, Utility Systems, Electrical Power & Controls, Switch Gear/Motor Control Center (H3WILLUEGM)
    - WIL Lock, Utility Systems, Electrical Power & Controls, Lightning Protection System (H3WILLUELP)
    - WIL Lock, Utility Systems, Electrical Power & Controls, Lighting Systems (H3WILLUELS)
  - WIL Lock, Utility Systems, Hydraulic System (H3WILLUH)
    - WIL Lock, Utility Systems, Hydraulic System, Distribution System (H3WILLUHHD)
    - WIL Lock, Utility Systems, Hydraulic System, Pumps, Backup (H3WILLUHHPB)
    - WIL Lock, Utility Systems, Hydraulic System, Pumps, Primary (H3WILLUHHPP)
    - WIL Lock, Utility Systems, Hydraulic System, Valves And Controls (H3WILLUHHVC)
  - WIL Lock, Utility Systems, Combined Service/Potable Water System (H3WILLUSPW)
    - WIL Lock, Utility Systems, Combined Service/Potable Water System, Pumps & Controls (H3WILLUSPWWC)
    - WIL Lock, Utility Systems, Combined Service/Potable Water System, Distribution System (H3WILLUSPWWD)
  - WIL Lock, Utility Systems, Service Water (Only) System (H3WILLUSW)
    - WIL Lock, Utility Systems, Service Water (Only) System, Pumps & Controls (H3WILLUSWWC)
    - WIL Lock, Utility Systems, Service Water (Only) System, Distribution System (H3WILLUSWWD)
- WIL Lock, Valves (H3WILLV)
  - WIL Lock, Primary Lock Chamber Valves, Tainter (H3WILL01VT)
    - WIL Lock, Valves, Tainter, Emptying, Land Wall, Primary Chamber (H3WILL01VTEL)
    - WIL Lock, Valves, Tainter, Emptying, River Wall, Primary Chamber (H3WILL01VTER)
    - WIL Lock, Valves, Tainter, Filling, Land Wall, Primary Chamber (H3WILL01VTFL)
    - WIL Lock, Valves, Tainter, Filling, River Wall, Primary Chamber (H3WILL01VTFR)
    - WIL Lock, Valves, Tainter, Supplemental Emptying, Land Wall, Primary Chamber (H3WILL01VTSEL)
    - WIL Lock, Valves, Tainter, Supplemental Emptying, River Wall, Primary Chamber (H3WILL01VTSER)
  - WIL Lock, Auxiliary Lock Chamber Valves, Tainter (H3WILL02VT)
    - WIL Lock, Valves, Tainter, Emptying, Land Wall, Auxiliary Chamber, Upper (H3WILL02VTELU)
    - WIL Lock, Valves, Tainter, Emptying, River Wall, Auxiliary Chamber, Lower (H3WILL02VTERL)
    - WIL Lock, Valves, Tainter, Emptying, River Wall, Auxiliary Chamber, Upper (H3WILL02VTERU)
    - WIL Lock, Valves, Tainter, Filling, Land Wall, Auxiliary Chamber, Upper (H3WILL02VTFLU)
    - WIL Lock, Valves, Tainter, Filling, River Wall, Auxiliary Chamber, Upper (H3WILL02VTFRU)
  - WIL Lock, Valves, Operating Machinery (H3WILLVM)

- WIL Lock, Valves, Other Items (H3WILLVO)
- WIL Lock, Valves, Tainter (H3WILLVT)
- WIL Lock, Closure Systems (H3WILLX)
  - WIL Lock, Closure Systems, Maintenance (H3WILLXM)
    - WIL Lock, Closure Systems, Maintenance, Bulkheads (H3WILLXMB)
    - WIL Lock, Closure Systems, Maintenance, Lifting Frames (H3WILLXMF)
    - WIL Lock, Closure Systems, Maintenance, Hoisting Equipment (H3WILLXMH)
    - WIL Lock, Closure Systems, Maintenance, Stop Logs (H3WILLXMS)

B.2. Lower Monumental Lock and Dam

- LCQ-2 480 Volt Control Center (G4-3NSLCQ20)
- LCQ-3 480 Volt Control Center (G4-3NSLCQ30)
- LCQ-4 480 Volt Control Center (G4-3NSLCQ40)
- LQ-1 480 Volt Distribution Panel (G4-3NSLQ100)
- LQ-4 480 Volt Distribution Panel (G4-3NSLQ400)
- LQ-5 480 Volt Distribution Panel (G4-3NSLQ500)
- LSQ-1 480-volt switchgear (G4-3NSLSQ10)
- LSQ-2 480 Volt Switchgear (G4-3NSLSQ20)
- 120 VOLT LOAD CENTER (G4-3NSLR000)
  - LR-3 SWITCHGEAR (G4-3NPLR300)
  - LR-5 SWITCHGEAR (G4-3NPLR500)
  - LRS-2 SWITCHGEAR (G4-3NPLRS20)
  - LR-1 SWITCHGEAR (G4-3NSLR100)
  - LR-2 SWITCHGEAR (G4-3NSLR200)
  - LR-4 SWITCHGEAR (G4-3NSLR400)
  - LRS-1 SWITCHGEAR (G4-3NSLRS10)
- TAINTER VALVES (G4-3NV00000)
  - DRAIN VALVES (G4-3NVDZ000)
    - DRAIN VALVE #1 (G4-3NVDV100)
      - HYDRAULIC CYL (G4-3NVDV1HC)
      - TAINTER VALVE #1 (G4-3NVDV1TV)
      - AUTO LUBE SYS (G4-3NVDVLS1)
      - HYDRAULIC UNIT (G4-3NVDZ0HD)
    - DRAIN VALVE #2 (G4-3NVDV200)
      - HYDRUALIC CYL (G4-3NVDV2HC)
      - HYDRUALIC UNIT (G4-3NVDV2HU)
      - TAINTER VALVE #2 (G4-3NVDV2TV)
      - AUTO LUBE SYS (G4-3NVDVLS2)
    - DRAIN VALVE CONTROLS (G4-3NVDVC00)
  - FILL VALVES #3 & 4 (G4-3NVFZ000)
    - FILL VALVLE #3 (G4-3NVFV300)
      - HYDRAULIC CYL (G4-3NVFV3HC)
      - HYDRAULIC UNIT (G4-3NVFV3HU)
      - TAINTER VALVE #3 (G4-3NVFV3TV)
      - AUTO LUBE SYSTEM (G4-3NVFVLS3)
    - FILL VALVE #4 (G4-3NVFV400)
      - HYDRAULIC CYL (G4-3NVFV4HC)
      - HYDRAULIC UNIT (G4-3NVFV4HU)
      - TAINTER VALVE #4 (G4-3NVFV4TV)
      - AUTO LUBE SYS (G4-3NVFVLS4)
    - FILL VALVE CONTROLS (G4-3NVFVC00)
- DRAINAGE & UNWATERING SYSTEM (G4-3NW00000)
  - PUMPS (G4-3NWPU000)
    - UNWATERING PUMP #1 (G4-3NWP1000)
      - MOTOR CONTROLLER (G4-3NWP1MC0)
    - UNWATERING PUMP #2 (G4-3NWP2000)
      - MOTOR CONTROLLER (G4-3NWP2MC0)
    - UNWATERING PUMP #3 (G4-3NWP3000)
      - MOTOR CONTROLLER (G4-3NWP3MC0)
    - TAINTER VALVE UW PUMP #4 (G4-3NWP4000)
      - MOTOR CONTROLLER (G4-3NWP4MC0)
    - TAINTER VALVE UW PUMP #5 (G4-3NWP5000)
      - MOTOR CONTROLLER (G4-3NWP5MC0)
- COMPRESSED AIR SYSTEM (G4-3NX00000)
  - #1 NAV LOCK COMPRESSOR (G4-3NAC1000)
    - MOTOR CONTROLLER (G4-3NXAC1MC)
  - #2 NAV LOCK COMPRESSOR (G4-3NAC2000)
    - MOTOR CONTROLLER (G4-3NXAC2MC)
  - #3 NAV LOCK COMPRESSOR (G4-3NAC3000)
    - MOTOR CONTROLLER (G4-3NXAC3MC)
  - INTERCOM (G4-3NEIC000)
  - BUBBLERS (G4-3NXBU000)
  - NORTH ELEVATOR (G4-3NXEL000)
  - SOUTH ELEVATOR (G4-3NXELS00)
- FIRE SYSTEMS (G4-3NXFS000)
  - WATER CONON D/S (G4-3NFSWCDS)
  - WATER CONON U/S (G4-3NFSWCUS)
  - FIRE PUMP #1 (G4-3NXFSP10)

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    |MOTOR CONTROLLER    (G4-3NFSP1C)
|FIRE PUMP #2    (G4-3NXFSP20)
    |MOTOR CONTROLLER    (G4-3NFSP2C)
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Appendix C: OCA and FEM Component Comparisons

The OCA critical components are compared to components listed in FEM for Wilson Lock and Dam and Lower Monumental Lock and Dam.

C.1. Wilson Lock and Dam

KEY: 1. Feature 2. System 3. Sub-System 4. Component 5. Sub-Component

1. Lock 2. Lock Filling and Empting Systems 3. F/E Operating Machinery 4. Direct Acting Cylinder (Hydraulic) 5. Check Valve 5. Connection Pin 5. Crosshead 5. Crosshead Guide 5. Hydraulic Cylinder Support 5. Hydraulic Cylinder - Ceramic 5. Hydraulic Cylinder - Chrome/Stainless 5. Hydraulic Hosing - Flexible	

5. Hydraulic Piping - Carbon Steel 5. Hydraulic Piping - Stainless Steel 5. Linkage 4. Bellcrank Assembly (Hydraulic or Electric) 5. Bell Crank 5. Check Valve 5. Connection Pin 5. Crosshead 5. Crosshead Guide 5. Hydraulic Cylinder Support 5. Hydraulic Cylinder – Ceramic 5. Hydraulic Cylinder - Chrome/Stainless 5. Hydraulic Motor (Fixed) 5. Hydraulic Motor (Variable)	

5. Hydraulic Piping - Carbon Steel	
5. Hydraulic Piping - Stainless Steel	
5. Linkage	
5. Strut Arm Pin	
5. Strut Arm, Rigid	
5. Strut Arm Spring	
4. Electric Operating Equipment F/E Valves	
5. Brake - Electric Elements	
5. Electric Motor	
5. Motor Starter (Full Voltage)	
5. Motor Starter (Reduced Voltage)	
5. Motor Starter (Variable Frequency)	
5. Power Cable - Flex/Cable Trays	
5. Power Cable - Submerged/Conduit	

4. Gear Drive Assembly (Electric) 5. Bevel Gear 5. Brake - Mechanical Pads & Springs 5. Connecting Shaft - Rotating 5. Flexible Coupling 5. Gear Reducer/Parallel Gears 5. Helical Gear 5. Hydraulic Motor (Fixed) 5. Hydraulic Motor (Variable) 5. Linkage 5. Rack 5. Right Angle Gear 5. Rigid Coupling 5. Sector Gear	

5. Spur/Pinnion Gear 5. Strut Arm Pin 5. Strut Arm, Rigid 5. Strut Arm Spring 5. Torque Tube 4. Gear Drive Assembly (Hydraulic) 5. Check Valve 5. Hydraulic Cylinder Support 5. Hydraulic Cylinder - Chrome/Stainless 5. Hydraulic Piping - Carbon Steel 5. Hydraulic Piping - Stainless Steel 5. Linkage 5. Rack 5. Rack Rollers	

5. Sector Gear	
5. Stem	
5. Strut Arm Pin	
5. Strut Arm, Rigid	
5. Strut Arm Spring	
5. Torque Tube	
4. Rope Hoist Mechanism (Electric)	
5. Bevel Gear	
5. Brake - Mechanical Pads & Springs	
5. Connecting Shaft - Rotating	
5. Flexible Coupling	
5. Gear Reducer/Parallel Gears	
5. Helical Gear	
5. Right Angle Gear	

5. Rigid Coupling	
5. Rope Other Material (Define)	
5. Rope Sockets	
5. Spur/Pinnion Gear	
5. Strut Arm Pin	
5. Strut Arm Spring	
5. Wire Rope - Carbon Steel	
5. Wire Rope - Stainless Steel	
4. Rope Hoist Mechanism (Hydraulic)	
5. Check Valve	
5. Crosshead	
5. Crosshead Guide	
5. Hydraulic Cylinder Support	
5. Hydraulic Cylinder - Chrome/Stainless	

5. Linkage	
5. Rope Other Material (Define)	
5. Rope Sockets	
5. Sheave Guide Assembly	
5. Strut Arm Pin	
5. Strut Arm Spring	
5. Wire Rope Attachment Casting	
5. Wire Rope - Carbon Steel	
5. Wire Rope - Stainless Steel	
4. Round Valve (Hydraulic or Electric)	
5. Check Valve	
5. Electric Actuator	
5. Hydraulic Cylinder Support	
5. Hydraulic Cylinder - Chrome/Stainless	

5. Hydraulic Piping - Carbon Steel 5. Hydraulic Piping - Stainless Steel 5. Rack 5. Rack Rollers 5. Sector Gear 5. Stem 3. F/E Valve Anchorages & Supports 4. Valve Anchorage 5. Corrosion 5. Fatigue 3. F/E Valves 4. Butterfly Valve (Horizontal Pivot) 5. Corrosion 5. Fatigue	

4. Butterfly Valve (Vertical Pivot) 5. Corrosion 5. Fatigue 4. Cylindrical Plunger Valve 5. Corrosion 5. Fatigue 4. Multiple Round Valve System 5. Round Valve Fatigue 4. Reverse Tainter Valve	Valves, Tainter, Emptying, Land Wall, Primary Chamber Valves, Tainter, Emptying, River Wall, Primary Chamber Valves, Tainter, Filling, Land Wall, Primary Chamber Valves, Tainter, Filling, River Wall, Primary Chamber Valves, Tainter, Supplemental Emptying, Land Wall, Primary Chamber Valves, Tainter, Supplemental Emptying, River Wall,

	Primary Chamber
5. Corrosion	
5. Fatigue	
4. Slide Gate Valve	
5. Corrosion	
5. Fatigue	
4. Stoney Gate Valve	
5. Corrosion	
5. Fatigue	
2. Lock Gates & Operating Machinery	Valves, Other Items, Debris Guards, Intakes, Primary Chamber
3. Lock Gate Anchorages & Support Features	
4. Lift Gate Anchorage	
5. Embedded Anchorage Assembly - Fatigue	
5. Embedded Guides Corrosion	

4. Miter Gate Anchorage 5. Anchorage Bar (Parallel) - Fatigue 5. Anchorage Bar (Perpendicular) - Fatigue 5. Anchorage Pin/Wedge Pin - Fatigue 5. Embedded Anchorage Assembly - Fatigue 5. Gudgeon Pin 5. Link Pin - Fatigue 4. Roller Gate Anchorage 5. Embedded Anchorage Assembly - Fatigue 5. Embedded Frame/Guide Assembly - Corrosion 4. Sector Gate Anchorage 5. Embedded Hinge/Anchorage Assembly - Fatigue 5. Hinge Pin - Fatigue 5. Hinge/Bracket Support - Corrosion	

5. Hinge/Bracket Support - Fatigue 4. Tainter Gate Anchorage 5. Embedded Trunnion Assembly - Fatigue 5. Yoke Assembly - Corrosion 5. Yoke Assembly - Fatigue 3. Lock Gate Operating Equipment 4. Automatic Lubrication System (AIS) 5. Feed and Supply Lines 5. Injectors 5. Metering Device 5. Operating Mechanism 5. Pump 5. Reservoir 5. Timer	

4. Chain Hoist Mechanism (Electric) 5. Brake - Mechanical Pads & Springs 5. Chain Coupling (Shackle & Pin) 5. Chain Roller Type 5. Chain - Link Type 5. Connecting Shaft - Rotating 5. Counterweights 5. Flexible Coupling 5. Gear Reducer/Parallel Gears 5. Hydraulic Motor (Fixed) 5. Hydraulic Motor (Variable) 5. Right Angle Gear 5. Rigid Coupling 5. Sector Gear	

5. Slip Clutch 5. Sprocket 5. Spur/Pinnion Gear 4. Direct Acting Hydraulic Cylinder 5. Check Valve 5. Connection Pin 5. Crosshead 5. Crosshead Guide 5. Hydraulic Cylinder Support 5. Hydraulic Cylinder - Ceramic 5. Hydraulic Cylinder - Chrome/Stainless 5. Hydraulic Hosing - Flexible 5. Hydraulic Piping - Carbon Steel 5. Hydraulic Piping - Stainless Steel	

4. Electrical Operating Equipment (Lock Gates)	
5. Brake - Electric Elements	
5. Electric Motor	
5. Motor Starter (Full Voltage)	
5. Motor Starter (Reduced Voltage)	
5. Motor Starter (Variable Frequency)	
5. Power Cable - Flex/Cable Trays	
5. Power Cable - Submerged/Conduit	
4. Ohio River Type Assembly (Electric)	
5. Bevel Gear	
5. Brake - Mechanical Pads & Springs	
5. Connection Pin	
5. Gear Reducer/Parallel Gears	
5. Gudgeon Pin	

5. Helical Gear	
5. Rack	
5. Rack Rollers	
5. Right Angle Gear	
5. Sector Arm	
5. Sector Gear	
5. Sector Pin	
5. Strut Arm Pin	
5. Strut Arm, Rigid	
5. Strut Arm Spring	
4. Ohio River Type Assembly (Hydraulic)	
5. Check Valve	
5. Connection Pin	
5. Gudgeon Pin	

5. Hydraulic Cylinder Support 5. Hydraulic Cylinder - Ceramic 5. Hydraulic Cylinder - Chrome/Stainless 5. Hydraulic Piping - Carbon Steel 5. Hydraulic Piping - Stainless Steel 5. Rack 5. Rack Rollers 5. Sector Arm 5. Sector Gear 5. Sector Pin 5. Strut Arm Pin 5. Strut Arm, Rigid 5. Strut Arm Spring 4. Packaged Direct Connected Hydraulic Cylinder Assembly	

5. Check Valve	
5. Connection Pin	
5. Hydraulic Cylinder Support	
5. Hydraulic Cylinder - Ceramic	
5. Hydraulic Cylinder - Chrome/Stainless	
5. Hydraulic Hosing - Flexible	
5. Hydraulic Piping - Carbon Steel	
5. Hydraulic Piping - Stainless Steel	
5. Integrated HPU	
4. Panama Type Assembly (Electric)	
5. Bevel Gear	
5. Brake - Mechanical Pads & Springs	
5. Connection Pin	
5. Gear Reducer/Parallel Gears	

5. Gudgeon Pin	
5. Helical Gear	
5. Rack	
5. Rack Rollers	
5. Right Angle Gear	
5. Sector Arm	
5. Sector Gear	
5. Sector Pin	
5. Strut Arm Pin	
5. Strut Arm, Rigid	
5. Strut Arm Spring	
4. Rope Hoist Mechanism (Electric)	
5. Brake - Mechanical Pads & Springs	
5. Connecting Shaft - Rotating	

5. Counterweights	
5. Drum	
5. Flexible Coupling	
5. Gear Reducer/Parallel Gears	
5. Geared Sheave	
5. Hydraulic Motor (Fixed)	
5. Multipart Sheave	
5. Plain Sheave	
5. Right Angle Gear	
5. Rigid Coupling	
5. Spur/Pinion Gear	
5. Wire Rope Coupling	
5. Wire Rope - Carbon Steel	
5. Wire Rope - Stainless Steel	

4. Rope Hoist Mechanism (Hydraulic)	
5. Check Valve	
5. Counterweights	
5. Crosshead	
5. Crosshead Guide	
5. Geared Sheave	
5. Hydraulic Cylinder Support	
5. Hydraulic Cylinder - Ceramic	
5. Hydraulic Cylinder - Chrome/Stainless	
5. Hydraulic Piping - Carbon Steel	
5. Hydraulic Piping - Stainless Steel	
5. Multipart Sheave	
5. Plain Sheave	
5. Rope Other Material (Define)	

5. Sheave Guide Assembly	
5. Wire Rope Attachment Casting	
5. Wire Rope Coupling	
5. Wire Rope - Carbon Steel	
5. Wire Rope - Stainless Steel	
4. Wire Rope Cable (Horizontal Pull) Assembly	
5. Brake - Mechanical Pads & Springs	
5. Connecting Shaft - Rotating	
5. Drum	
5. Gear Reducer/Parallel Gears	
5. Geared Sheave	
5. Multipart Sheave	
5. Plain Sheave	
5. Right Angle Gear	

5. Rope Other Material (Define)	
5. Spur/Pinion Gear	
5. Wire Rope Coupling	
5. Wire Rope - Carbon Steel	
5. Wire Rope - Stainless Steel	
3. Lock Gate Structures	Primary Lock Chamber Gates
4. Miter Type Gate	Gates, Miter, Downstream, Primary Chamber
5. Diagonals - Corrosion	
5. Diagonals - Fatigue	
5. Horizontal Girders - Corrosion	
5. Horizontal Girders - Fatigue	
5. Skin Plate Assembly - Corrosion	
5. Vertical Girders - Corrosion	
5. Vertical Girders - Fatigue	

4. Roller Type Gate	
5. Horizontal Girders - Corrosion	
5. Horizontal Girders - Fatigue	
5. Skin Plate Assembly - Corrosion	
5. Vertical Girders - Corrosion	
5. Vertical Girders - Fatigue	
4. Sector Type Gate	
5. Bracing/Diagonals - Corrosion	
5. Bracing/Diagonals - Fatigue	
5. Center Post - Corrosion	
5. Center Post - Fatigue	
5. Hinge Assembly - Corrosion	
5. Hinge Assembly - Fatigue	
5. Horizontal Trusses - Corrosion	

5. Horizontal Trusses - Fatigue	
5. Skin Plate Assembly - Corrosion	
4. Tainter Type Gate	
5. Horizontal Girders - Corrosion	
5. Horizontal Girders - Fatigue	
5. Left End Frame - Corrosion	
5. Left End Frame - Fatigue	
5. Left Hub Assembly - Corrosion	
5. Left Hub Assembly - Fatigue	
5. Right End Frame - Corrosion	
5. Right End Frame - Fatigue	
5. Right Hub Assembly - Corrosion	
5. Right Hub Assembly - Fatigue	
5. Skin Plate Assembly - Corrosion	

5. Vertical Girders - Corrosion	
5. Vertical Girders - Fatigue	
4. Vertical Lift Type Gate	Gates, Lift, Upstream, Primary Chamber
5. Horizontal Trusses - Corrosion	
5. Horizontal Trusses - Fatigue	
5. Roller/Truck Assemblies - Fatigue	
5. Roller/Truck Assemblies - Corrosion	
5. Skin Plate Assembly - Corrosion	
5. Vertical Panel - Corrosion	
5. Vertical Panel - Fatigue	
3. Misc Lock Gate Features	
4. Gate Fire Suppression System	
5. Gate Fire Protection System	
4. Gate Latching Devices	

5. Electric Driven Operator	
5. Gate Latching Device	
5. Hydraulic Driven Operator	
5. Manual Operator	
4. Gate Seals	Gates, Other Items, Seals, Primary Chamber
5. Seal Heater System	
5. Seals	
5. Seals, Other Material (Define)	
5. Seals, Rubber	
5. Seals, Timber	
4. Lock Gate Cathodic Protection	
5. Impressed Current System	
5. Sacrificial Anodes	
4. Lock Gate Fenders	

5. Fender Supports	
5. Fenders Other Materials (Define)	
5. Steel Fenders	
5. Timber Fenders	
5. Uhmw Fenders	
4. Miter Guide	
5. Guide Bracket	
5. Miter Device	
5. Roller(s)	
4. Pintles	
5. Pintle	
5. Pintle Ball	
5. Pintle Base & Anchorage	
5. Pintle Casting (On Gate)	

4. Quoin Blocks & Other Load Blocks	
5. Contact Blocks	
5. Embedded Quoin Section	
5. Quoin Blocks (On Gate)	
2. Lock Structure	
3. Lock Walls & Other Lock Structures	
4. Bulkhead Sill	
5. Deterioration	
5. Stability	
5. Structural	Structures, Floor System, Primary Chamber
4. Chamber Floor	
5. Deterioration	
5. Foundation Drainage System	
5. Foundation Pressure Relief System	

5. Seepage Cutoff System	
5. Stability	
5. Structural	
4. Filling/Emptying Culverts	
5. Deterioration	
5. Structural	
4. Gate Sill	Structures, Miter Sill, Downstream, Primary Chamber Structures, Miter Sill, Upstream, Primary Chamber
5. Deterioration	
5. Foundation Drainage System	
5. Foundation Pressure Relief System	
5. Foundation System	
5. Seepage Cutoff System	
5. Stability	
5. Structural	

4. Guard Sill	Structures, Guard Sill, Downstream, Primary Chamber Structures, Guard Sill, Upstream, Primary Chamber
5. Deterioration	
5. Stability	
5. Structural	
4. Guard Wall	Structures, Lock Walls, Lower Guide Wall, Primary Chamber
5. Deterioration	
5. Foundation Drainage System	
5. Foundation Pressure Relief System	
5. Foundation System	
5. Seepage Cutoff System	
5. Stability	
5. Structural	
4. Guide Wall	Structures, Lock Walls, Upper Guide Wall, Primary Chamber
5. Deterioration	

5. Foundation Drainage System 5. Foundation Pressure Relief System 5. Foundation System 5. Seepage Cutoff System 5. Stability 5. Structural	
4. Landside Wall	Structures, Lock Walls, Land Wall, Primary Chamber
5. Deterioration 5. Foundation Drainage System 5. Foundation Pressure Relief System 5. Foundation System 5. Seepage Cutoff System 5. Stability 5. Structural	

4. Middle/Intermediate Wall	
5. Deterioration	
5. Foundation Drainage System	
5. Foundation Pressure Relief System	
5. Foundation System	
5. Seepage Cutoff System	
5. Stability	
5. Structural	
4. Miscellaneous Paving	
5. Curbs	
5. Esplanade Paving	
5. Exterior Plaza Areas	
5. Heliport Pads	
5. Retaining Walls	Structures, Other Structural Systems, Retaining Walls

5. Sidewalks 5. Slope Paving 4. Nose Pier 5. Deterioration 5. Foundation System 5. Stability 5. Structural 4. Pier Wall 5. Deterioration 5. Foundation Drainage System 5. Foundation Pressure Relief System 5. Foundation System 5. Seepage Cutoff System 5. Stability	

5. Structural	
4. Riverside Wall	Structures, Lock Walls, River Wall, Primary Chamber
5. Deterioration	
5. Foundation Drainage System	
5. Foundation Pressure Relief System	
5. Foundation System	
5. Seepage Cutoff System	
5. Stability	
5. Structural	
3. Misc Lock Features	
4. Docks, Wharfs and Lock Mooring Facilities	
5. Fixed Dock	
5. Floating Dock	
5. Mooring Features	

5. Paved Boat Ramp	
5. Safe Harbors	
5. Unpaved Boat Ramp	
5. Wharfs & Bulkheads	
4. Elevator	Miscellaneous Systems, Elevator
5. Elevator Car & Structure	Miscellaneous Systems, Elevator, Cars And Equipment
5. Elevator Controls	Miscellaneous Systems, Elevator, Power And Controls
5. Elevator Hoisting Equipment	
4. Fish & Wildlife Protection Features	
5. Fish Barriers	
5. Fish Deterrent Systems	
5. Fish Diversion Structures	
5. Fish Ladders	
5. Manatee Barriers	

5. Other Wildlife Barriers	
4. Guide Rail, Roads, and Parking Areas	
5. Guide Rail, Parking Areas	
5. Guide Rail, Roadways	
4. Jib Cranes, Davits & Light Hoists	
5. Davit	
5. Jib Crane	
5. Light Hoist	
4. Lock Access Road	
5. Drainage Systems	
5. Embankment	Structures, Embankments, Downstream Approach Structures, Embankments, Upstream Approach
5. Guide Rail, Parking Areas	
5. Guide Rail, Roadways	

5. Paving	
4. Lock Approach Clearance	
5. Obstructions	
5. Shoaling	
4. Lock Chamber Clearance	
5. Debris Accumulation	
5. Obstructions	
4. Lock Parking Area	
5. Drainage Systems	
5. Embankment	
5. Paving	
4. Saltwater Control Systems	
5. Air System Features	
5. Barriers and Gates	

5. By-Pass (Diversion) Conduits	
5. Circulation Conduits	
5. Electric Power	
5. Hydraulic Power	
5. Machinery	
5. Machinery Houses	
5. Operating Controls	
5. Pump & Machinery Controls	
5. Pumps	
4. Shoreline Erosion Protection	Structures, Erosion Protection, Downstream Approach, Primary Chamber Structures, Erosion Protection, Upstream Approach, Primary Chamber Structures, Erosion Protection, Downstream, Landside Embankment Structures, Erosion Protection, Downstream, River Wall Structures, Erosion Protection, Upstream, Landside Embankment
5. Armor Stone	

5. Bedding & Fill Layers 5. Filter Layer 4. Stairs, Walkways & Work Platforms 5. Paved Walkways 5. Stairways, Concrete 5. Stairways, Steel 5. Work Platforms 3. Misc Lock Wall Features 4. Bulkhead Slot Fillers 5. Corrosion/Deterioration 5. Damage/Loss 4. Debris Screens, Culvert Ports 5. Damage/Loss 4. Emergency Gate Screens/Slot Fillers/Protectors	

5. Corrosion/Deterioration	
5. Damage/Loss	
4. Grating/Cover Plates	
5. Aluminum Cover Plates	
5. Aluminum Grating	
5. Concrete Cover Plates	
5. Steel Cover Plates	
5. Steel Grating	
4. Handrailing & Safety Rail	
5. Aluminum Pipe Post & Rail	
5. Steel Pipe Post & Rail	
5. Wire Rope with Post	
4. Ladders	
5. Aluminum Ladder	

5. Steel Ladder	
5. Steel Rungs in Recess	
4. Trash Racks, Culvert Intakes	
5. Damage/Loss	
4. Utility Crossovers/Tunnels	
5. Infiltration	
4. Wall Armor/Fenders	
5. Corrosion/Deterioration	
5. Damage/Loss	
2. Navigational Aids & Auxiliary Facilities	
3. Mooring Facilities	
4. Mooring Facilities	
5. Mooring Buoy No. 01	
5. Mooring Dolphin/Mooring Pier No. 01	

5. Mooring Buoy No. 2 5. Mooring Buoy No. 3 5. Mooring Buoy No. 4 5. Mooring Buoy No. 5 5. Mooring Cell No. 01 5. Mooring Cell No. 2 5. Mooring Cell No. 3 5. Mooring Cell No. 4 5. Mooring Cell No. 5 5. Mooring Dolphin/Mooring Pier No. 2 5. Mooring Dolphin/Mooring Pier No. 3 5. Mooring Dolphin/Mooring Pier No. 4 5. Mooring Dolphin/Mooring Pier No. 5 3. Navigation Aides	

4. Flow Control Features	
5. Exposed Training Dikes	
5. Other Flow Control Aides	
5. Shuttered Guard Walls	
5. Submerged Training Dikes	
5. Wing Dams	
4. Navigation Aides	
5. Air Horns/Audible Signal System	
5. Air Tuggers	
5. Bollards & Deadmen	
5. Capstans	
5. Check Posts	
5. Fender Collision Boom (Incl. Equipment)	
5. Floating Mooring Bits	Structures, Navigation Aides, Floating Mooring Bits, Primary Chamber

5. Tow Haulage System 5. Traffic Signal System	Structures, Navigation Aides, Tow Haulage Systems, Primary Chamber

C.2. Lower Monumental Lock and Dam

1. Lock 2. Lock Filling and Empting Systems 3. F/E Operating Machinery 4. Direct Acting Cylinder (Hydraulic) 5. Check Valve 5. Connection Pin 5. Crosshead 5. Crosshead Guide 5. Hydraulic Cylinder Support 5. Hydraulic Cylinder - Ceramic 5. Hydraulic Cylinder - Chrome/Stainless 5. Hydraulic Hosing - Flexible	

5. Hydraulic Piping - Carbon Steel	
5. Hydraulic Piping - Stainless Steel	
5. Linkage	
4. Bellcrank Assembly (Hydraulic or Electric)	
5. Bell Crank	
5. Check Valve	
5. Connection Pin	
5. Crosshead	
5. Crosshead Guide	
5. Hydraulic Cylinder Support	
5. Hydraulic Cylinder - Ceramic	
5. Hydraulic Cylinder - Chrome/Stainless	
5. Hydraulic Motor (Fixed)	
5. Hydraulic Motor (Variable)	

5. Hydraulic Piping - Carbon Steel	
5. Hydraulic Piping - Stainless Steel	
5. Linkage	
5. Strut Arm Pin	
5. Strut Arm, Rigid	
5. Strut Arm Spring	
4. Electric Operating Equipment F/E Valves	
5. Brake - Electric Elements	
5. Electric Motor	
5. Motor Starter (Full Voltage)	
5. Motor Starter (Reduced Voltage)	
5. Motor Starter (Variable Frequency)	
5. Power Cable - Flex/Cable Trays	
5. Power Cable - Submerged/Conduit	

4. Gear Drive Assembly (Electric) 5. Bevel Gear 5. Brake - Mechanical Pads & Springs 5. Connecting Shaft - Rotating 5. Flexible Coupling 5. Gear Reducer/Parallel Gears 5. Helical Gear 5. Hydraulic Motor (Fixed) 5. Hydraulic Motor (Variable) 5. Linkage 5. Rack 5. Right Angle Gear 5. Rigid Coupling 5. Sector Gear	

5. Spur/Pinnion Gear 5. Strut Arm Pin 5. Strut Arm, Rigid 5. Strut Arm Spring 5. Torque Tube 4. Gear Drive Assembly (Hydraulic) 5. Check Valve 5. Hydraulic Cylinder Support 5. Hydraulic Cylinder - Chrome/Stainless 5. Hydraulic Piping - Carbon Steel 5. Hydraulic Piping - Stainless Steel 5. Linkage 5. Rack 5. Rack Rollers	

5. Sector Gear	
5. Stem	
5. Strut Arm Pin	
5. Strut Arm, Rigid	
5. Strut Arm Spring	
5. Torque Tube	
4. Rope Hoist Mechanism (Electric)	
5. Bevel Gear	
5. Brake - Mechanical Pads & Springs	
5. Connecting Shaft - Rotating	
5. Flexible Coupling	
5. Gear Reducer/Parallel Gears	
5. Helical Gear	
5. Right Angle Gear	

5. Rigid Coupling	
5. Rope Other Material (Define)	
5. Rope Sockets	
5. Spur/Pinnion Gear	
5. Strut Arm Pin	
5. Strut Arm Spring	
5. Wire Rope - Carbon Steel	
5. Wire Rope - Stainless Steel	
4. Rope Hoist Mechanism (Hydraulic)	
5. Check Valve	
5. Crosshead	
5. Crosshead Guide	
5. Hydraulic Cylinder Support	
5. Hydraulic Cylinder - Chrome/Stainless	

5. Linkage	
5. Rope Other Material (Define)	
5. Rope Sockets	
5. Sheave Guide Assembly	
5. Strut Arm Pin	
5. Strut Arm Spring	
5. Wire Rope Attachment Casting	
5. Wire Rope - Carbon Steel	
5. Wire Rope - Stainless Steel	
4. Round Valve (Hydraulic or Electric)	
5. Check Valve	
5. Electric Actuator	
5. Hydraulic Cylinder Support	
5. Hydraulic Cylinder - Chrome/Stainless	

5. Hydraulic Piping - Carbon Steel	
5. Hydraulic Piping - Stainless Steel	
5. Rack	
5. Rack Rollers	
5. Sector Gear	
5. Stem	
3. F/E Valve Anchorages & Supports	
4. Valve Anchorage	
5. Corrosion	
5. Fatigue	
3. F/E Valves	
4. Butterfly Valve (Horizontal Pivot)	
5. Corrosion	
5. Fatigue	

4. Butterfly Valve (Vertical Pivot)	
5. Corrosion	
5. Fatigue	
4. Cylindrical Plunger Valve	
5. Corrosion	
5. Fatigue	
4. Multiple Round Valve System	
5. Round Valve Fatigue	
4. Reverse Tainter Valve	
5. Corrosion	
5. Fatigue	
4. Slide Gate Valve	
5. Corrosion	
5. Fatigue	

4. Stoney Gate Valve 5. Corrosion 5. Fatigue 2. Lock Gates & Operating Machinery 3. Lock Gate Anchorages & Support Features 4. Lift Gate Anchorage 5. Embedded Anchorage Assembly - Fatigue 5. Embedded Guides Corrosion 4. Miter Gate Anchorage 5. Anchorage Bar (Parallel) - Fatigue 5. Anchorage Bar (Perpendicular) - Fatigue 5. Anchorage Pin/Wedge Pin - Fatigue 5. Embedded Anchorage Assembly - Fatigue 5. Gudgeon Pin	

5. Link Pin - Fatigue	
4. Roller Gate Anchorage	
5. Embedded Anchorage Assembly - Fatigue	
5. Embedded Frame/Guide Assembly - Corrosion	
4. Sector Gate Anchorage	
5. Embedded Hinge/Anchorage Assembly - Fatigue	
5. Hinge Pin - Fatigue	
5. Hinge/Bracket Support - Corrosion	
5. Hinge/Bracket Support - Fatigue	
4. Tainter Gate Anchorage	
5. Embedded Trunnion Assembly - Fatigue	
5. Yoke Assembly - Corrosion	
5. Yoke Assembly - Fatigue	
3. Lock Gate Operating Equipment	

4. Automatic Lubrication System (AIS)	
5. Feed and Supply Lines	
5. Injectors	
5. Metering Device	
5. Operating Mechanism	
5. Pump	
5. Reservoir	
5. Timer	
4. Chain Hoist Mechanism (Electric)	
5. Brake - Mechanical Pads & Springs	
5. Chain Coupling (Shackle & Pin)	
5. Chain Roller Type	
5. Chain - Link Type	
5. Connecting Shaft - Rotating	

5. Counterweights 5. Flexible Coupling 5. Gear Reducer/Parallel Gears 5. Hydraulic Motor (Fixed) 5. Hydraulic Motor (Variable) 5. Right Angle Gear 5. Rigid Coupling 5. Sector Gear 5. Slip Clutch 5. Sprocket 5. Spur/Pinnion Gear 4. Direct Acting Hydraulic Cylinder 5. Check Valve 5. Connection Pin	

5. Crosshead	
5. Crosshead Guide	
5. Hydraulic Cylinder Support	
5. Hydraulic Cylinder - Ceramic	
5. Hydraulic Cylinder - Chrome/Stainless	
5. Hydraulic Hosing - Flexible	
5. Hydraulic Piping - Carbon Steel	
5. Hydraulic Piping - Stainless Steel	
4. Electrical Operating Equipment (Lock Gates)	
5. Brake - Electric Elements	
5. Electric Motor	
5. Motor Starter (Full Voltage)	
5. Motor Starter (Reduced Voltage)	
5. Motor Starter (Variable Frequency)	

5. Power Cable - Flex/Cable Trays	
5. Power Cable - Submerged/Conduit	
4. Ohio River Type Assembly (Electric)	
5. Bevel Gear	
5. Brake - Mechanical Pads & Springs	
5. Connection Pin	
5. Gear Reducer/Parallel Gears	
5. Gudgeon Pin	
5. Helical Gear	
5. Rack	
5. Rack Rollers	
5. Right Angle Gear	
5. Sector Arm	
5. Sector Gear	

5. Sector Pin	
5. Strut Arm Pin	
5. Strut Arm, Rigid	
5. Strut Arm Spring	
4. Ohio River Type Assembly (Hydraulic)	
5. Check Valve	
5. Connection Pin	
5. Gudgeon Pin	
5. Hydraulic Cylinder Support	
5. Hydraulic Cylinder - Ceramic	
5. Hydraulic Cylinder - Chrome/Stainless	
5. Hydraulic Piping - Carbon Steel	
5. Hydraulic Piping - Stainless Steel	
5. Rack	

5. Rack Rollers 5. Sector Arm 5. Sector Gear 5. Sector Pin 5. Strut Arm Pin 5. Strut Arm, Rigid 5. Strut Arm Spring 4. Packaged Direct Connected Hydraulic Cylinder Assembly 5. Check Valve 5. Connection Pin 5. Hydraulic Cylinder Support 5. Hydraulic Cylinder - Ceramic 5. Hydraulic Cylinder - Chrome/Stainless 5. Hydraulic Hosing - Flexible	

5. Hydraulic Piping - Carbon Steel	
5. Hydraulic Piping - Stainless Steel	
5. Integrated HPU	
4. Panama Type Assembly (Electric)	
5. Bevel Gear	
5. Brake - Mechanical Pads & Springs	
5. Connection Pin	
5. Gear Reducer/Parallel Gears	
5. Gudgeon Pin	
5. Helical Gear	
5. Rack	
5. Rack Rollers	
5. Right Angle Gear	
5. Sector Arm	

5. Sector Gear	
5. Sector Pin	
5. Strut Arm Pin	
5. Strut Arm, Rigid	
5. Strut Arm Spring	
4. Rope Hoist Mechanism (Electric)	
5. Brake - Mechanical Pads & Springs	
5. Connecting Shaft - Rotating	
5. Counterweights	
5. Drum	
5. Flexible Coupling	
5. Gear Reducer/Parallel Gears	
5. Geared Sheave	
5. Hydraulic Motor (Fixed)	

5. Multipart Sheave	
5. Plain Sheave	
5. Right Angle Gear	
5. Rigid Coupling	
5. Spur/Pinnion Gear	
5. Wire Rope Coupling	
5. Wire Rope - Carbon Steel	
5. Wire Rope - Stainless Steel	
4. Rope Hoist Mechanism (Hydraulic)	
5. Check Valve	
5. Counterweights	
5. Crosshead	
5. Crosshead Guide	
5. Geared Sheave	

5. Hydraulic Cylinder Support	
5. Hydraulic Cylinder - Ceramic	
5. Hydraulic Cylinder - Chrome/Stainless	
5. Hydraulic Piping - Carbon Steel	
5. Hydraulic Piping - Stainless Steel	
5. Multipart Sheave	
5. Plain Sheave	
5. Rope Other Material (Define)	
5. Sheave Guide Assembly	
5. Wire Rope Attachment Casting	
5. Wire Rope Coupling	
5. Wire Rope - Carbon Steel	
5. Wire Rope - Stainless Steel	
4. Wire Rope Cable (Horizontal Pull) Assembly	

5. Brake - Mechanical Pads & Springs	
5. Connecting Shaft - Rotating	
5. Drum	
5. Gear Reducer/Parallel Gears	
5. Geared Sheave	
5. Multipart Sheave	
5. Plain Sheave	
5. Right Angle Gear	
5. Rope Other Material (Define)	
5. Spur/Pinnion Gear	
5. Wire Rope Coupling	
5. Wire Rope - Carbon Steel	
5. Wire Rope - Stainless Steel	
3. Lock Gate Structures	

4. Miter Type Gate	
5. Diagonals - Corrosion	
5. Diagonals - Fatigue	
5. Horizontal Girders - Corrosion	
5. Horizontal Girders - Fatigue	
5. Skin Plate Assembly - Corrosion	
5. Vertical Girders - Corrosion	
5. Vertical Girders - Fatigue	
4. Roller Type Gate	
5. Horizontal Girders - Corrosion	
5. Horizontal Girders - Fatigue	
5. Skin Plate Assembly - Corrosion	
5. Vertical Girders - Corrosion	
5. Vertical Girders - Fatigue	

4. Sector Type Gate	
5. Bracing/Diagonals - Corrosion	
5. Bracing/Diagonals - Fatigue	
5. Center Post - Corrosion	
5. Center Post - Fatigue	
5. Hinge Assembly - Corrosion	
5. Hinge Assembly - Fatigue	
5. Horizontal Trusses - Corrosion	
5. Horizontal Trusses - Fatigue	
5. Skin Plate Assembly - Corrosion	
4. Tainter Type Gate	
5. Horizontal Girders - Corrosion	
5. Horizontal Girders - Fatigue	
5. Left End Frame - Corrosion	

5. Left End Frame - Fatigue	
5. Left Hub Assembly - Corrosion	
5. Left Hub Assembly - Fatigue	
5. Right End Frame - Corrosion	
5. Right End Frame - Fatigue	
5. Right Hub Assembly - Corrosion	
5. Right Hub Assembly - Fatigue	
5. Skin Plate Assembly - Corrosion	
5. Vertical Girders - Corrosion	
5. Vertical Girders - Fatigue	
4. Vertical Lift Type Gate	
5. Horizontal Trusses - Corrosion	
5. Horizontal Trusses - Fatigue	
5. Roller/Truck Assemblies - Fatigue	

5. Roller/Truck Assemblies - Corrosion	
5. Skin Plate Assembly - Corrosion	
5. Vertical Panel - Corrosion	
5. Vertical Panel - Fatigue	
3. Misc Lock Gate Features	
4. Gate Fire Suppression System	
5. Gate Fire Protection System	
4. Gate Latching Devices	
5. Electric Driven Operator	
5. Gate Latching Device	
5. Hydraulic Driven Operator	
5. Manual Operator	
4. Gate Seals	
5. Seal Heater System	

5. Seals	
5. Seals, Other Material (Define)	
5. Seals, Rubber	
5. Seals, Timber	
4. Lock Gate Cathodic Protection	
5. Impressed Current System	
5. Sacrificial Anodes	
4. Lock Gate Fenders	
5. Fender Supports	
5. Fenders Other Materials (Define)	
5. Steel Fenders	
5. Timber Fenders	
5. Uhmw Fenders	
4. Miter Guide	

5. Guide Bracket 5. Miter Device 5. Roller(s) 4. Pintles 5. Pintle 5. Pintle Ball 5. Pintle Base & Anchorage 5. Pintle Casting (On Gate) 4. Quoin Blocks & Other Load Blocks 5. Contact Blocks 5. Embedded Quoin Section 5. Quoin Blocks (On Gate) 2. Lock Structure 3. Lock Walls & Other Lock Structures	

4. Bulkhead Sill	
5. Deterioration	
5. Stability	
5. Structural	
4. Chamber Floor	
5. Deterioration	
5. Foundation Drainage System	
5. Foundation Pressure Relief System	
5. Seepage Cutoff System	
5. Stability	
5. Structural	
4. Filling/Emptying Culverts	
5. Deterioration	
5. Structural	

4. Gate Sill 5. Deterioration 5. Foundation Drainage System 5. Foundation Pressure Relief System 5. Foundation System 5. Seepage Cutoff System 5. Stability 5. Structural 4. Guard Sill 5. Deterioration 5. Stability 5. Structural 4. Guard Wall 5. Deterioration	

5. Foundation Drainage System	
5. Foundation Pressure Relief System	
5. Foundation System	
5. Seepage Cutoff System	
5. Stability	
5. Structural	
4. Guide Wall	
5. Deterioration	
5. Foundation Drainage System	
5. Foundation Pressure Relief System	
5. Foundation System	
5. Seepage Cutoff System	
5. Stability	
5. Structural	

4. Landside Wall 5. Deterioration 5. Foundation Drainage System 5. Foundation Pressure Relief System 5. Foundation System 5. Seepage Cutoff System 5. Stability 5. Structural 4. Middle/Intermediate Wall 5. Deterioration 5. Foundation Drainage System 5. Foundation Pressure Relief System 5. Foundation System 5. Seepage Cutoff System	

5. Stability 5. Structural 4. Miscellaneous Paving 5. Curbs 5. Esplanade Paving 5. Exterior Plaza Areas 5. Heliport Pads 5. Retaining Walls 5. Sidewalks 5. Slope Paving 4. Nose Pier 5. Deterioration 5. Foundation System 5. Stability	

5. Structural 4. Pier Wall 5. Deterioration 5. Foundation Drainage System 5. Foundation Pressure Relief System 5. Foundation System 5. Seepage Cutoff System 5. Stability 5. Structural 4. Riverside Wall 5. Deterioration 5. Foundation Drainage System 5. Foundation Pressure Relief System 5. Foundation System	

5. Seepage Cutoff System	
5. Stability	
5. Structural	
3. Misc Lock Features	
4. Docks, Wharfs and Lock Mooring Facilities	
5. Fixed Dock	
5. Floating Dock	
5. Mooring Features	
5. Paved Boat Ramp	
5. Safe Harbors	
5. Unpaved Boat Ramp	
5. Wharfs & Bulkheads	
4. Elevator	
5. Elevator Car & Structure	

5. Elevator Controls	
5. Elevator Hoisting Equipment	
4. Fish & Wildlife Protection Features	
5. Fish Barriers	
5. Fish Deterrent Systems	
5. Fish Diversion Structures	
5. Fish Ladders	
5. Manatee Barriers	
5. Other Wildlife Barriers	
4. Guide Rail, Roads, and Parking Areas	
5. Guide Rail, Parking Areas	
5. Guide Rail, Roadways	
4. Jib Cranes, Davits & Light Hoists	
5. Davit	

5. Jib Crane	
5. Light Hoist	
4. Lock Access Road	
5. Drainage Systems	
5. Embankment	
5. Guide Rail, Parking Areas	
5. Guide Rail, Roadways	
5. Paving	
4. Lock Approach Clearance	
5. Obstructions	
5. Shoaling	
4. Lock Chamber Clearance	
5. Debris Accumulation	
5. Obstructions	

4. Lock Parking Area 5. Drainage Systems 5. Embankment 5. Paving 4. Saltwater Control Systems 5. Air System Features 5. Barriers and Gates 5. By-Pass (Diversion) Conduits 5. Circulation Conduits 5. Electric Power 5. Hydraulic Power 5. Machinery 5. Machinery Houses 5. Operating Controls	

5. Pump & Machinery Controls	
5. Pumps	
4. Shoreline Erosion Protection	
5. Armor Stone	
5. Bedding & Fill Layers	
5. Filter Layer	
4. Stairs, Walkways & Work Platforms	
5. Paved Walkways	
5. Stairways, Concrete	
5. Stairways, Steel	
5. Work Platforms	
3. Misc Lock Wall Features	
4. Bulkhead Slot Fillers	FLOATING BULKHEADS UNWATERING PUMP #1 MOTOR CONTROLLER

5. Corrosion/Deterioration	FLOATING BULKHEADS UNWATERING PUMP #2 MOTOR CONTROLLER FLOATING BULKHEADS UNWATERING PUMP #3 MOTOR CONTROLLER FLOATING BULKHEADS UNWATERING PUMP #4 MOTOR CONTROLLER FILL/EMPTYING VALVE BULKHEADS LOCK EMPTYING VALVE BULKHEAD LOCK EMPTYING VALVE BULKHEAD V2 LOCK EMPTYING VALVE BULKHEAD V1 LOCK FILL VALVE BULKHEAD LOCK FILL VALVE BULKHEAD V3 LOCK FILL VALVE BULKHEAD V4

5. Damage/Loss	
4. Debris Screens, Culvert Ports	
5. Damage/Loss	
4. Emergency Gate Screens/Slot Fillers/Protectors	
5. Corrosion/Deterioration	
5. Damage/Loss	
4. Grating/Cover Plates	
5. Aluminum Cover Plates	
5. Aluminum Grating	
5. Concrete Cover Plates	
5. Steel Cover Plates	
5. Steel Grating	
4. Handrailing & Safety Rail	
5. Aluminum Pipe Post & Rail	

5. Steel Pipe Post & Rail	
5. Wire Rope with Post	
4. Ladders	
5. Aluminum Ladder	
5. Steel Ladder	
5. Steel Rungs in Recess	
4. Trash Racks, Culvert Intakes	
5. Damage/Loss	
4. Utility Crossovers/Tunnels	
5. Infiltration	
4. Wall Armor/Fenders	
5. Corrosion/Deterioration	
5. Damage/Loss	
2. Navigational Aids & Auxiliary Facilities	

3. Mooring Facilities 4. Mooring Facilities 5. Mooring Buoy No. 01 5. Mooring Dolphin/Mooring Pier No. 01 5. Mooring Buoy No. 2 5. Mooring Buoy No. 3 5. Mooring Buoy No. 4 5. Mooring Buoy No. 5 5. Mooring Cell No. 01 5. Mooring Cell No. 2 5. Mooring Cell No. 3 5. Mooring Cell No. 4 5. Mooring Cell No. 5 5. Mooring Dolphin/Mooring Pier No. 2	

5. Mooring Dolphin/Mooring Pier No. 3 5. Mooring Dolphin/Mooring Pier No. 4 5. Mooring Dolphin/Mooring Pier No. 5 3. Navigation Aides 4. Flow Control Features 5. Exposed Training Dikes 5. Other Flow Control Aides 5. Shuttered Guard Walls 5. Submerged Training Dikes 5. Wing Dams 4. Navigation Aides 5. Air Horns/Audible Signal System 5. Air Tuggers 5. Bollards & Deadmen	

5. Capstans 5. Check Posts 5. Fender Collision Boom (Incl. Equipment) 5. Floating Mooring Bits 5. Tow Haulage System 5. Traffic Signal System	

Appendix D: FEM Job Plans

Job plans for Bayou Sorrel, Lower Mountain Lock and Dam, and New Cumberland Lock and Dam are given in this appendix.

D.1. Bayou Sorrel

PM & Jobplan Listing by Asset

Site = MVN-A

See the last page for field explanations

Org Code **B2R0022**

B2AS **Bayou Sorrel Lock Top Level**

No PMs for B2AS

B2ASL **Lock**

	ASSET / PM / JOB PLAN / jptask		CREW / SEQUENCE	FREQUENCY
	BSL-2398	WEEKLY SHIFT 1 LOCK OPERATORS	B2AS-LO	2 WEEKS
	Next Date 6/18/12	Next Job BSL-15105 Use Target Start:	Y	
1	BSL-15105	WEEKLY SHIFT 1 LOCK OPERATORS DUTIES	1	
	10	COMMUNICATE WITH TOWS		
	20	OPERATE GATES & CHECK GUIDEWALLS		
	30	INPUT DATA INTO LPMS & EDIT MONTHLY REPORTS		
	40	SHIFT 1 CONTROL HOUSE & OTHER DUTIES		
2	BSL-2402	WEEKLY SHIFT 2 LOCK OPERATORS	B2AS-LO	2 WEEKS
	Next Date 6/18/12	Next Job BSL-15111 Use Target Start:	Y	
	BSL-15111	WEEKLY SHIFT 2 LOCK OPERATORS DUTIES	1	
	10	COMMUNICATE WITH TOWS		
	20	OPERATE GATES & CHECK GUIDEWALLS		
	30	INPUT DATA INTO LPMS & EDIT MONTHLY REPORTS		
	40	SHIFT 2 CONTROL HOUSE & OTHER DUTIES		
3	BSL-2403	WEEKLY SHIFT 1 LOCK OPERATORS	B2AS-LO	2 WEEKS
	Next Date 6/17/12	Next Job BSL-15110 Use Target Start:	Y	
	BSL-15110	WEEKLY SHIFT 1 LOCK OPERATORS DUTIES	1	
	10	COMMUNICATE WITH TOWS		
	20	OPERATE GATES & CHECK GUIDEWALLS		
	30	INPUT DATA INTO LPMS & EDIT MONTHLY REPORTS		
	40	SHIFT 1 CONTROL HOUSE & OTHER DUTIES		
4	BSL-2404	WEEKLY SHIFT 2 LOCK OPERATORS	B2AS-LO	2 WEEKS
	Next Date 6/17/12	Next Job BSL-15108 Use Target Start:	Y	
	BSL-15108	WEEKLY SHIFT 2 LOCK OPERATORS DUTIES	1	
	10	COMMUNICATE WITH TOWS		
	20	OPERATE GATES & CHECK GUIDEWALLS		
	30	INPUT DATA INTO LPMS & EDIT MONTHLY REPORTS		
	40	SHIFT 2 CONTROL HOUSE & OTHER DUTIES		
5	BSL-2420	WEEKLY ADMINISTRATIVE WORK	B2AS-AD	1 WEEKS
	Next Date 6/11/12	Next Job BSL-15160 Use Target Start:	Y	
	BSL-15160	WEEKLY ADMINISTRATIVE WORK	1	
	10	CHECK GW DAILY		
	20	ENTER TIME INTO CEFMS		
	30	DO REPORTS		
	40	POST MAIL		
	50	SEND OVERTIME REQUEST		
	60	HANDLE ROUTINE CORRESPONDENCE		
	70	HANDLE ROUTINE COMMUNICATIONS BY PHONE		
6	BSL-2421	WEEKLY MECHANIC'S PAPERWORK	B2AS-MA	1 WEEKS
	Next Date 6/17/12	Next Job BSL-15162 Use Target Start:	Y	
	BSL-15162	WEEKLY MECHANIC'S PAPERWORK	1	
	10	UPDATE MAXIMO WEEKLY		
	20	KEEP UP INDIVIDUAL LOGS FOR EQUIP.		
	30	ORDER SUPPLIES AND PARTS AS NEEDED		
	40	UPDATE PROGRAMS AS NEEDED.		
	50	GENERAL OFFICE DUTIES		
7	BSL-2422	WEEKLY SAFETY MEETING	B2AS-AD	1 WEEKS
	Next Date 6/17/12	Next Job BSL-15164 Use Target Start:	Y	
	BSL-15164	WEEKLY SAFETY MEETING	1	

10 HOLD SAFETY MEETING
20 PARTICIPATORY MANAGEMENT
30 SAFETY FILM
40 SAFETT MANUAL - REVIEW

8 BSL-2423 END OF MONTH REPORTS B2AS-AD 1 MONTHS
Next 6/28/12 Next Job BSL-15167 Use Target Start: Y
BSL-15167 END OF MONTH REPORTS 1
10 END OF MONTH REPORTS FOR FOLLOWING

9 BSL-2424 MONTHLY MAN OVERBOARD & FIRE DRILL B2AS-AD 1 MONTHS
Next 7/5/12 Next Job BSL-15170 Use Target Start: Y
BSL-15170 MONTHLY MAN OVERBOARD & FIRE DRILL 1
10 HOLD MAN OVERBOARD DRILL
20 HOLD FIRE DRILL

10 BSL-2425 MONTHLY FIRE ALARM CHECKS B2AS-MA 1 MONTHS
Next 6/21/12 Next Job BSL-15173 Use Target Start: Y
BSL-15173 MONTHLY FIRE ALARM CHECKS 1
10 TEST FIRE ALARMS
20 CHANGE BATTERY WHEN TIME CHANGES

11 BSL-2426 MONTHLY FIRE EXTINGUISHER CHECKS B2AS-MA 1 MONTHS
Next 7/8/12 Next Job BSL-15174 Use Target Start: Y
BSL-15174 MONTHLY FIRE EXTINGUISHER INSP. 1
10 INSPECT MONTHLY
20 CHECK FOR FULL CHARGE
30 CHECK HOSE AND PINS
40 RECHARGE & REPLACE AS NEEDED
50 MARK MONTHLY TAG

12 BSL-2428 YEARLY FIRE STATIONS MAINT. & INSP. B2AS-MA 1 YEARS
Next 11/13/12 Next Job BSL-15177 Use Target Start: Y
BSL-15177 YEARLY FIRE STATIONS MAINT. & INSP. 1
10 CHECK HOSE PRESSURE
20 CHECK NOZZLES
30 CHECK HOSE CONDITION & REPLACE AS NEEDED
40 CLEAN/PAINT STATIONS AS NEEDED
50 REPAIR HOSE REELS AS NEEDED

13 BSL-2429 YEARLY LIFE RING BUOY MAINT. & INSP. B2AS-MA 0 DAYS
Next Next Job BSL-15179 Use Target Start: Y
BSL-15179 YEARLY LIFE RING BUOYS MAINT. & INSP. 1
10 CHECK LINES
20 CHECK PHYSICAL CONDITION
30 REPAIR/REPLACE AS NEEDED
40 PAINT PREPARED AREAS

14 BSL-2431 MONTHLY EYE WASH STATION MAINT. & INSP. B2AS-MA 1 MONTHS
Next 6/21/12 Next Job BSL-15181 Use Target Start: Y
BSL-15181 MONTHLY EYE WASH STATION MAINT. & INSP. 1
10 CHECK FOR LEAKS
20 CLEAN
30 RUN WATER THRU STATION

End of Asset B2ASL

B2ASLG Gates

15 BSL-1715 WEEKLY LOCK GATE INSPECTIONS B2AS-MA 1 WEEKS
Next 6/17/12 Next Job BSL-14268 Use Target Start: Y
BSL-14268 WEEKLY LOCK GATE INSPECTIONS 1
10 DAILY INSPECTION OF LOCK GATES

BSL-1719 WEEKLY LOCK GATE MACHINERY CHECKS B2AS-MA 2 WEEKS
Next 6/18/12 Next Job BSL-14270 Use Target Start: Y
16 BSL-14270 WEEKLY LOCK GATE MACHINERY CHECKS 1
10 CHECK GATE MACHINERY WHILE IN OPERATION
20 CHECK FOR HYDRAULIC LEAKS AND REPAIR AS NEEDED
30 WIPE UP ANY SPILLED OR LEAKED HYDRAULIC FLUID
40 CLEAN DRIP PANS AND PUT NEW OIL PADS AROUND ENGINE MACHINERY
50 MAKE ANY AND ALL ADJUSTMENTS TO MACHINERY AS NEEDED.

60 TIGHEN UP ALL LOOSE HYDRAULIC HOSES.
70 CHECK SETTING ON BRAKE AND ADJUST IF NEEDED.
80 MAKE OVERALL INSPECTION OF MACHINERY AND MAKE REPAIRS AS NEEDED

17 BSL-1721 WEEKLY BULL GEAR MAINT. & INSP. B2AS-MA 1 WEEKS
Next Date 6/11/12 Next Job BSL-14271 Use Target Start: Y
BSL-14271 WEEKLY BULL GEAR MAINT. & INSP. 1
10 GREASE EXPOSED BULL GEAR WITH HIGH GEAR 20/20.
20 CLEAN UP ANY GREASE ON FLOOR OF ENGINE BED.
30 CHECK FIT OF BULL GEAR INTO GATE RACK
40 GREASE GATE RACK AS NEEDED
50 MAKE REPAIRS AS NEEDED

18 BSL-2386 MONTHLY INSP. OF DRIER CRYSTALS B2AS-MA 1 MONTHS
Next Date 6/22/12 Next Job BSL-15092 Use Target Start: Y
BSL-15092 MONTHLY INSP. OF DRIER CRYSTALS 1
10 INSPECT DRIER CRYSTALS AND CHANGE AS NEEDED

19 BSL-2387 HYDRAULIC OIL SAMPLING B2AS-MA 6 MONTHS
Next Date 6/17/12 Next Job BSL-15093 Use Target Start: Y
BSL-15093 HYDRAULIC OIL SAMPLING 1
10 PULL SAMPLES FROM 3 POINTS ON EACH GATE
20 SEND SAMPLES IN FOR ANALYSIS

20 BSL-2395 YEARLY GATE HINGE MAINT. & INSP. B2AS-MA 1 YEARS
Next Date 7/10/12 Next Job BSL-15100 Use Target Start: Y
BSL-15100 YEARLY GATE HINGE MAINT. & INSP. 1
10 INSPECT GATE HINGE & MOUNTING BOLTS
20 CHIP, SCRAP & QUROX GATE HINGE AS NEEDED
30 INSPECT GATE HINGE FOR DEFECTS
40 WASH OUT GATE HINGE BED
50 REPORT ANY PROBLEMS TO LOCK MASTER

End of Asset B2ASLG

B2ASLG1 Gate1

No PMs for B2ASLG1

B2ASLG1EM Electric Motor

No PMs for B2ASLG1EM

B2ASLG1HG Hydraulic Group

No PMs for B2ASLG1HG

B2ASLG1HGF Hydraulic Filters

No PMs for B2ASLG1HGF

B2ASLG1HGFP Primary Filter

No PMs for B2ASLG1HGFP

B2ASLG1HGFS Secondary Filter

No PMs for B2ASLG1HGFS

B2ASLG1HGH Hydraulic Hoses

No PMs for B2ASLG1HGH

B2ASLG1HGI Hydraulic Reservoir Isolator

No PMs for B2ASLG1HGI

B2ASLG1HGM Hydraulic Manifold

No PMs for B2ASLG1HGM

B2ASLG1HGV Proportional Directional Valve

No PMs for B2ASLG1HGV

B2ASLG1HM Hydraulic Bull Gear Motor

No PMs for B2ASLG1HM

B2ASLG1HP Hydraulic Pump

No PMs for B2ASLG1HP

B2ASLG2	**Gate 2**
	No PMs for B2ASLG2
B2ASLG2EM	**Electric Motor**
	No PMs for B2ASLG2EM
B2ASLG2HG	**Hydraulic Group**
	No PMs for B2ASLG2HG
B2ASLG2HGF	**Hydraulic Filters**
	No PMs for B2ASLG2HGF
B2ASLG2HGFI	**Primary Filter**
	No PMs for B2ASLG2HGFP
B2ASLG2HGFS	**Secondary Filter**
	No PMs for B2ASLG2HGFS
B2ASLG2HGH	**Hydraulic Hoses**
	No PMs for B2ASLG2HGH
B2ASLG2HGI	**Hydraulic Reservoir Isolator**
	No PMs for B2ASLG2HGI
B2ASLG2HGM	**Hydraulic Manifold**
	No PMs for B2ASLG2HGM
B2ASLG2HGV	**Proportional Directional Valve**
	No PMs for B2ASLG2HGV
B2ASLG2HM	**Hydraulic Bull Gear Motor**
	No PMs for B2ASLG2HM
B2ASLG2HP	**Hydraulic Pump**
	No PMs for B2ASLG2HP
B2ASLG3	**Gate 3**
	No PMs for B2ASLG3
B2ASLG3EM	**Electric Motor**
	No PMs for B2ASLG3EM
B2ASLG3HG	**Hydraulic Group**
	No PMs for B2ASLG3HG
B2ASLG3HGF	**Hydraulic Filters**
	No PMs for B2ASLG3HGF
B2ASLG3HGFI	**Primary Filter**
	No PMs for B2ASLG3HGFP
B2ASLG3HGFS	**Secondary Filter**
	No PMs for B2ASLG3HGFS
B2ASLG3HGH	**Hydraulic Hoses**
	No PMs for B2ASLG3HGH
B2ASLG3HGI	**Hydraulic Reservoir Isolator**
	No PMs for B2ASLG3HGI
B2ASLG3HGM	**Hydraulic Manifold**
	No PMs for B2ASLG3HGM
B2ASLG3HGV	**Proportional Directional Valve**
	No PMs for B2ASLG3HGV
B2ASLG3HM	**Hydraulic Bull Gear Motor**
	No PMs for B2ASLG3HM
B2ASLG3HP	**Hydraulic Pump**

No PMs for B2ASLG3HP

B2ASLG4 **Gate 4**

No PMs for B2ASLG4

B2ASLG4EM **Electric Motor**

No PMs for B2ASLG4EM

B2ASLG4HG **Hydraulic Group**

No PMs for B2ASLG4HG

B2ASLG4HGF **Hydraulic Filters**

No PMs for B2ASLG4HGF

B2ASLG4HGFI **Primary Filter**

No PMs for B2ASLG4HGFP

B2ASLG4HGFS **Secondary Filter**

No PMs for B2ASLG4HGFS

B2ASLG4HGH **Hydraulic Hoses**

No PMs for B2ASLG4HGH

B2ASLG4HGI **Hydraulic Reservoir Isolator**

No PMs for B2ASLG4HGI

B2ASLG4HGM **Hydraulic Manifold**

No PMs for B2ASLG4HGM

B2ASLG4HGV **Proportional Directional Valve**

No PMs for B2ASLG4HGV

B2ASLG4HM **Hydraulic Bull Gear Motor**

No PMs for B2ASLG4HM

B2ASLG4HP **Hydraulic Pump**

No PMs for B2ASLG4HP

B2ASLGS **Spare Gate Parts**

No PMs for B2ASLGS

B2ASLGSDV **Proportional Directional Valve**

No PMs for B2ASLGSDV

B2ASLGSEM **Electric Motors**

No PMs for B2ASLGSEM

B2ASLGSHP **Hydraulic Pumps**

No PMs for B2ASLGSHP

B2ASLGSHP1 **Denison Hydraulic Pump #1**

No PMs for B2ASLGSHP1

B2ASLGSHP2 **Denison Hydraulic Pump #2**

No PMs for B2ASLGSHP2

B2ASLI **Infrastructure**

21 BSL-2397 YEARLY SHEET PILES & DOLPHIN INSP. B2AS-MA 1 YEARS
Next Date 6/13/12 Next Job BSL-15103 Use Target Start: Y

BSL-15103 YEARLY SHEET PILES & DOLPHIN INSP. 1

10 CHECK FOR BREAKS
20 CHECK FOR RUST
30 CHIP AND PRIME AS REQUIRED
40 PAINT AS NEEDED
50 REPAIR AS NEEDED
60 WASH AS NECESSARY

End of Asset B2ASLI

B2ASLICD **Concrete Dolphin**

No PMs for B2ASLICD

B2ASLICW Chamber Walls

22 BSL-1399 MONTHLY LOCK CHAMBER & LIGHTING MAINT. & INSP. B2AS-MA 1 MONTHS
Next Date 7/9/12 Next Job BSL-13669 Use Target Start: Y

BSL-13669 MONTHLY LOCK CHAMBER & LIGHTING MAINT. & INSP. 1

10 CHECK LOCK CHAMBER GUIDEWALLS FOR UNKNOWN DAMAGE
20 CHECK WALKWAYS FOR ROTTEN OR MISSING BOARDS
30 CHECK LIGHTS
40 CHECK LIGHTING CONNECTIONS
50 CLEAN CONTACTS AND LENS
60 CHANGE BULBS AS NEEDED

End of Asset B2ASLICW

B2ASLIGW Guide Wall

No PMs for B2ASLIGW

B2ASLIGWL Guidewall Lighting

23 BSL-1401 MONTHLY GUIDEWALL LIGHTING MAINT. & INSP. B2AS-MA 1 MONTHS
Next Date 7/9/12 Next Job BSL-13673 Use Target Start: Y

BSL-13673 MONTHLY GUIDEWALL LIGHTING MAINT. & INSP. 1

10 CHECK LIGHTS
20 CHECK CONNECTIONS
30 CLEAN CONTACTS & LENS
40 CHANGE BULBS AS NEEDED

End of Asset B2ASLIGWL

B2ASLIHR Handrails

24 BSL-2430 YEARLY HANDRAILS & STEEL PILES MAINT. & INSP. B2AS-MA 1 YEARS
Next Date 10/19/12 Next Job BSL-15180 Use Target Start: Y

BSL-15180 YEARLY HANDRAIL & STEEL PILES MAINT. & INSP. 1

10 CHECK FOR BREAKS
20 CHECK FOR RUST
30 CHIP AND PRIME AS REQUIRED
40 WASH AND PAINT
50 REPAIR AS NEEDED

End of Asset B2ASLIHR

B2ASLISC Staircases

No PMs for B2ASLISC

B2ASLIWW Walkways

25 BSL-2396 WEEKLY GUIDEWALL WALKWAYS INSP. B2AS-MA 1 WEEKS
Next Date 6/17/12 Next Job BSL-15101 Use Target Start: Y

BSL-15101 WEEKLY GUIDEWALL WALKWAYS INSP. 1

10 CHECK NAVIGATION LIGHT AT END OF WALLS
20 CHECK GUIDEWALL FOR UNKNOWN DAMAGE
30 CHECK FOR ROTTEN OR MISSING BOARDS
40 CHECK GUIDEWALL LIGHTING
50 CLEAN LENS & CHANGE BULBS AS NEEDED

End of Asset B2ASLIWW

B2ASLL Leave

No PMs for B2ASLL

B2ASLLA Annual Leave

No PMs for B2ASLLA

B2ASLLAD Administrative Leave

No PMs for B2ASLLAD

B2ASLLF Family Sick Leave

No PMs for B2ASLLF

B2ASLLS Sick Leave

No PMs for B2ASLLS

B2ASLT **Trip For Offical Business**

No PMs for B2ASLT

B2ASLTR **Training/Travel**

No PMs for B2ASLTR

B2ASX **Project Support**

26 BSL-2407 YEARLY TIER TWO REPORTS B2AS-MA 1 YEARS
Next 1/8/13 Next Job BSL-15114 Use Target Start: Y
BSL-15114 YEARLY TIER TWO REPORTS 1
10 DUE TIER TWO REPORT
20 SENT COPY OF TIER TWO
30 WEB ADDRESS: www.dps.state.la.us/lcnweb.nsf
40 CHECK OLD REPORTS IN FILE CABINET

27 BSL-2408 YEARLY OMBIL - INTERNAL & EXTERNAL ASSESSMENTS B2AS-AD 1 YEARS
Next 1/8/13 Next Job BSL-15116 Use Target Start: Y
BSL-15116 YEARLY OMBIL - INTERNAL & EXTERNAL ASSESSMENTS 1
10 NAVIGATING TO OMBIL

End of Asset B2ASX

B2ASXB **Buildings and Grounds**

28 BSL-1099 MONTHLY A/C UNITS MAINT. & INSP. B2AS-MA 1 MONTHS
Next 7/9/12 Next Job BSL-12891 Use Target Start: Y
BSL-12891 MONTHLY A/C UNITS MAINT. & INSP. 1
10 Check AC filters / Change when needed
20 Check and clean coils when needed
30 Pour bleach in drain pipe on A/C Units before using during summer months

29 BSL-1110 WEEKLY POWER HOUSE INSPECTION B2AS-MA 1 WEEKS
Next 6/23/09 Next Job BSL-15098 Use Target Start: Y
BSL-15098 WEEKLY POWERHOUSE INSP. 1
10 CHECK DOORS
20 CHECK WINDOWS
30 CHECK LIGHTS
40 CHECK HOUSEKEEPING
50 GENERAL INSPECTION

30 BSL-1113 ANNUAL HURRICAN SHUTTER INSPECTION B2AS-MA 1 YEARS
Next 6/9/13 Next Job BSL-12931 Use Target Start: Y
BSL-12931 ANNUAL HURRICANE SHUTTER INSPECTION 1
10 Annual Hurricane Shutter Inspection

31 BSL-1377 MONTHLY ROADS & GROUNDS MAINT. & INSPECTION B2AS-MA 1 MONTHS
Next 7/9/12 Next Job BSL-13575 Use Target Start: Y
BSL-13575 MONTHLY ROADS & GROUNDS MAINT. & INSPECTION 1
10 PICK UP TRASH & DEBRIS.
20 GRADE ROADS AS NEEDED
30 REPAIR POT HOLES IN ROADS
40 SPRAY FENCE LINE & RIF RAF
50 CLEAN & TRIM AROUND DITCHES AND CULVERTS

32 BSL-1379 YEARLY FLOWER BEDS & TREES MAINT. & INSP. B2AS-MA 1 YEARS
Next 10/30/12 Next Job BSL-13585 Use Target Start: Y
BSL-13585 YEARLY FLOWER BEDS & TREES MAINT. & INSP. 1
10 WEED BEDS AS NEEDED
20 TRIM SHRUBS AND TREES
30 CHANGE OUT FLOWERS AS NEEDED
40 WATER & FERTILIZE
50 MAKE GENERAL OVERALL INSPECTION

33 BSL-1385 WEEKLY FRIDAY WORK SCHEDULE B2AS-MA 1 WEEKS
Next 6/17/12 Next Job BSL-13615 Use Target Start: Y
BSL-13615 WEEKLY FRIDAY WORK SCHEDULE 1
10 WASH VEHICLES
20 EMPTY GARBAGE CANS AND BRING TO DUMPSTER
30 CLEAN UP IN MECHANIC'S OFFICE, POWER HOUSE, TRACTOR SHED AND TOOL
40 CHECK GAS CANS AND FILL AS NEEDED
50 CHECK SUPPLIES AND MAKE LIST IF NEEDED

34 BSL-1395 MONTHLY HAZARD WASTE STORAGE MAINT. B2AS-MA 1 MONTHS
Next Date 7/9/12 Next Job BSL-13629 Use Target Start: Y
BSL-13629 MONTHLY HAZARD WASTE STORAGE MAINT. 1
10 CHECK FOR LEAKS
20 OIL PADLOCK
30 CLEAN AS NEEDED

End of Asset B2ASXB

B2ASXBBD Boat Dock

No PMs for B2ASXBBD

B2ASXBCH Control Houses

No PMs for B2ASXBCH

B2ASXBCH1 Control House #1

35 BSL-2391 WEEKLY NORTH CONTROL HOUSE INSP. B2AS-MA 1 WEEKS
Next Date 6/17/12 Next Job BSL-15096 Use Target Start: Y
BSL-15096 WEEKLY NORTH CONTROL HOUSE INSP. 1
10 CHECK LIGHTS
20 CHECK DOORS
30 CHECK WINDOWS
40 CHECK HOUSEKEEPING
50 GENERAL INSPECTION

36 BSL-2413 YEARLY NORTH END CONTROL HOUSE INSP. B2AS-MA 1 YEARS
Next Date 11/10/12 Next Job BSL-15144 Use Target Start: Y
BSL-15144 YEARLY NORTH END CONTROL HOUSE INSP. 1
10 CHECK DOORS
20 CHECK WINDOWS
30 WASH EXTERIOR
40 MAKE NEEDED REPAIRS AS REQUIRED
50 PAINT AS REQUIRED

End of Asset B2ASXBCH1

B2ASXBCH2 Control House #2

37 BSL-2392 WEEKLY SOUTH CONTROL HOUSE INSP. B2AS-MA 1 WEEKS
Next Date 6/17/12 Next Job BSL-15097 Use Target Start: Y
BSL-15097 WEEKLY SOUTH CONTROL HOUSE INSP. 1
10 CHECK LIGHTS
20 CHECK DOORS
30 CHECK WINDOWS
40 CHECK HOUSEKEEPING
50 GENERAL INSPECTION

38 BSL-2414 YEARLY SOUTH END CONTROL HOUSE INSP. B2AS-MA 1 YEARS
Next Date 11/10/12 Next Job BSL-15147 Use Target Start: Y
BSL-15147 YEARLY SOUTH END CONTROL HOUSE INSP. 1
10 CHECK DOORS
20 CHECK WINDOWS
30 WASH EXTERIOR
40 MAKE REPAIRS AS NEEDED
50 PAINT AS REQUIRED

End of Asset B2ASXBCH2

B2ASXBDR Southend Dayroom

39 BSL-1111 YEARLY SOUTHEND DAYROOM MAINT. & INSP. B2AS-MA 1 YEARS
Next Date 6/9/13 Next Job BSL-12930 Use Target Start: Y
BSL-12930 YEARLY SOUTHEND DAYROOM MAINT. & INSP. 1
10 Yearly Southend Dayroom - Maint. & Inspection

40 BSL-1391 MONTHLY SEWAGE TREATMENT PLANT MAINT. & INSP. B2AS-MA 1 MONTHS
Next Date 7/9/12 Next Job BSL-14522 Use Target Start: Y
BSL-14522 MONTHLY SEWAGE TREATMENT PLANT MAINT. & INSP. 1
10 GENERAL INSPECTION
20 CHECK FOR LEAKS
30 CHECK WIRING
40 CHECK CHLORINE TABLETS AND ADD AS NEEDED

50 CHECK ENZYNES AND ADD AS NEEDED
60 CHECK SEWAGE PLANT IN OPERATION
70 CLEAN AND PAINT AS NEEDED

End of Asset B2ASXBDR

B2ASXBE1 Ergo Building-Corrosives

No PMs for B2ASXBE1

B2ASXBE2 Ergo Building- Paint/Gas/Oil

41 BSL-1000 YEARLY FLAMMABLE STORAGE BUILDING INSP. B2AS-MA 1 YEARS
Next 9/25/12 Next Job BSL-12894 Use Target Start: Y
BSL-12894 YEARLY FLAMMABLE STORAGE BUILDING INSP. 1
10 Check Doors
20 Check Windows
30 Wash Exterior
40 Repair as needed
50 Paint as required

End of Asset B2ASXBE2

B2ASXBG Grounds Proper

42 BSL-1380 180 DAY SIGN MAINT. & INSP. B2AS-MA 180 DAYS
Next 9/18/12 Next Job BSL-13586 Use Target Start: Y
BSL-13586 180 DAY SIGN MAINT. & INSP.MVN 1
10 GENERAL INSPECTION OF ALL SIGNS
20 CLEAN AS NEEDED
30 WEEDEAT AROUND SIGN POST
BSL-1400 MONTHLY RESERVATION LIGHTING MAINT. & INSP. B2AS-MA 1 MONTHS
Next 7/9/12 Next Job BSL-13671 Use Target Start: Y
43 BSL-13671 MONTHLY RESERVATION LIGHTING MAINT. & INSP. 1
10 CHECK LIGHTS
20 CHECK CONNECTIONS
30 CLEAN CONTACTS & LENS
40 CHANGE BULBS AS NEEDED

End of Asset B2ASXBG

B2ASXBNL New Lock Office

44 BSL-1102 YEARLY OFFICE BUILDING INSPECTION B2AS-MA 1 YEARS
Next 12/4/12 Next Job BSL-12896 Use Target Start: Y
BSL-12896 YEARLY OFFICE BUILDING INSPECTION 1
10 Check Doors
20 Check windows
30 Wash exterior
40 Repair as needed
50 Paint as required

End of Asset B2ASXBNL

B2ASXBOL Old Lock Office/ North End Dayroom

45 BSL-1103 YEARLY OLD LOCK OFFICE BUILDING MAINT. & INSP. B2AS-MA 1 YEARS
Next 12/1/12 Next Job BSL-12900 Use Target Start: Y
BSL-12900 YEARLY OLD LOCK OFFICE BUILDING MAINT. & INSP. 1
10 Check Doors
20 Check Windows
30 Wash Exterior
40 Repair as needed
50 Paint as required

End of Asset B2ASXBOL

B2ASXBPG Powerhouse/Generator Room

46 BSL-1109 YEARLY POWER HOUSE MAINT. & INSP. B2AS-MA 1 YEARS
Next 6/9/13 Next Job BSL12920 Use Target Start: Y
BSL12920 YEARLY POWER HOUSE MAINT. & INSP. 1
10 Yearly Power House Maintenance & Inspection
47 BSL-2393 WEEKLY POWERHOUSE INSP. B2AS-MA 1 WEEKS
Next 6/11/12 Next Job BSL-15098 Use Target Start: Y

BSL-15098 WEEKLY POWERHOUSE INSP. 1
10 CHECK DOORS
20 CHECK WINDOWS
30 CHECK LIGHTS
40 CHECK HOUSEKEEPING
50 GENERAL INSPECTION

End of Asset B2ASXBPG

B2ASXBPL Parking Lots

No PMs for B2ASXBPL

B2ASXBPLE Parking Lot, East

No PMs for B2ASXBPLE

B2ASXBPLW Parking Lot, West

No PMs for B2ASXBPLW

B2ASXBSB Storage Building

No PMs for B2ASXBSB

B2ASXBTB Tool/Parts Building

48 BSL-1114 YEARLY TOOLS AND PARTS BUILDING MAINT. & INSP. B2AS-MA 1 YEARS
Next 6/9/13 Next Job BSL-12932 Use Target Start: Y
BSL-12932 YEARLY TOOLS AND PARTS BUILDING MAINT. & INSP. 1
10 Yearly Tool and Parts Building

End of Asset B2ASXBTB

B2ASXBTS Tractor Shed/ Shop Building

49 BSL-1115 YEARLY TRACTOR SHED MAINT. & INSP. B2AS-MA 1 YEARS
Next 6/9/13 Next Job BSL-12933 Use Target Start: Y
BSL-12933 YEARLY TRACTOR SHED MAINT. & INSP. 1
10 Yearly Tractor Shed Inspection

50 BSL-1375 ANNUAL TRACTOR SHED INSPECTION B2AS-MA 1 YEARS
Next 6/23/12 Next Job BSL-13572 Use Target Start: Y
BSL-13572 ANNUAL TRACTOR SHED INSPECTION 1
10 INSPECT BUILDING EXTERIOR
20 WASH BUILDING
30 CHECK DOORS
40 CHECK CLEANLINESS

End of Asset B2ASXBTS

B2ASXC Communications

No PMs for B2ASXC

B2ASXCC Cellular Telephones

No PMs for B2ASXCC

B2ASXCS Cisco Telephone System

No PMs for B2ASXCS

B2ASXCST Telephones

No PMs for B2ASXCST

B2ASXE Electrical Systems

51 BSL-1398 WEEKLY ELECTRICAL CONDUIT INSPECTION B2AS-MA 1 WEEKS
Next 6/17/12 Next Job BSL-13668 Use Target Start: Y
BSL-13668 WEEKLY ELECTRICAL CONDUIT TRUNKS INSPECTION 1
10 CHECK CONDUIT FOR WATER
20 PUMP AS REQUIRED
30 MAINTAIN 7 CONDUITS FOR OLD AND NEW WIRING

End of Asset B2ASXE

B2ASXEC Control Systems

52 BSL-1108 180 DAY PLC SYSTEM AND INSPECTION B2AS-MA 180 DAYS
Next 11/20/12 Next Job BSL-12912 Use Target Start: Y

BSL-12912 180 DAY PLC SYSTEM AND INSPECTION 1

10 PLC GATE OPERATION
20 PLC WATER GAUGE
30 GATE LASERS

End of Asset B2ASXEC

B2ASXECAT Automatic Transfer System

No PMs for B2ASXECAT

B2ASXECDS Disconnect Starter Panel

No PMs for B2ASXECDS

B2ASXECHC Hydraulic Control Curcuit (4)

No PMs for B2ASXECHC

B2ASXECTP Three Phase Disconnect

No PMs for B2ASXECTP

B2ASXECTR 408- Three Phase/ 208 Transformer

No PMs for B2ASXECTR

B2ASXEG Emergency Generator

53 BSL-1402 WEEKLY DIESEL GENERATOR MAINT. & INSP. B2AS-MA 1 WEEKS
Next 6/17/12 Next Job BSL-13674 Use Target Start: Y

BSL-13674 WEEKLY DIESEL GENERATOR MAINT. & INSP. 1

10 CHECK OIL
20 CHECK RADIATOR
30 CHECK DAY FUEL TANK
40 CHECK HOSES
50 CHECK BELTS
60 CHECK BATTERY & CABLES
70 CHECK FOR EXHAUST LEAKS
80 CHECK ELECTRICAL CONNECTIONS
90 GENERAL INSPECTION OF UNIT
100 CLEAN AS REQUIRED
110 RUN GENERATOR FOR 30 MINS. EVERY WEEK

54 BSL-1403 MONTHLY EMERGENCY PORTABLE DIESEL GENERATOR MAINT. & INSP. B2AS-MA 1 MONTHS
Next 7/9/12 Next Job BSL-13676 Use Target Start: Y

BSL-13676 MONTHLY EMERGENCY PORTABLE DIESEL GENERATOR MAINT. & INSP. 1

10 CHECK FUEL
20 CHECK OIL AND ADD IF NEEDED
30 START AND RUN FOR 15 MINUTES

End of Asset B2ASXEG

B2ASXEGDT 500 Gallon Diesel Tank

55 BSL-1392 YEARLY DIESEL FUEL TANK MAINT. & INSP. B2AS-MA 1 YEARS
Next 11/12/12 Next Job BSL-13627 Use Target Start: Y

BSL-13627 YEARLY DIESEL STORAGE TANK MAINT. & INSP. 1

10 CHECK TANK FOR LEAKS
20 CHECK DIESEL PUMP
30 CHECK CONTAINMENT AREA FOR LEAKS
40 CHECK PUMP HOSE AND REPLACE AS NEEDED
50 CLEAN TANK AND CONTAINMENT AREA
60 PAINT AS NEEDED

End of Asset B2ASXEGDT

B2ASXEGEG Generac 155KW Emergency Generator

No PMs for B2ASXEGEG

B2ASXF Floating Plant

No PMs for B2ASXF

B2ASXFB Boats

No PMs for B2ASXFB

B2ASXFBAS 14' Aluminum Skiff w/ 25 HP Mercury

56 BSL-1406 MONTHLY 14' BOAT AND MOTOR MAINT. & INSP. B2AS-MA 1 MONTHS
Next 7/9/12 Next Job BSL-13679 Use Target Start: Y

BSL-13679 MONTHLY 14' BOAT & MOTOR MAINT. & INSP. 1

10 CHECK FLOATION
20 INSPECT LINES
30 CHECK FUEL AND OIL
40 CLEAN AND PAINT AS REQUIRED
50 CHECK FIRE EXTINGUISHER
60 START MOTOR
70 CHECK PROP

End of Asset B2ASXFBAS

B2ASXFBBT 22' Back Track Trailer

57 BSL-2350 YEARLY 22' BOAT TRAILER MAINT. & INSP. B2AS-MA 1 YEARS
Next 6/29/12 Next Job BSL-15046 Use Target Start: Y

BSL-15046 YEARLY 22' BOAT TRAILER MAINT. & INSP. 1

10 CHECK LIGHTS
20 CHECK HITCH
30 CHECK TIRES
40 CHECK BEARINGS
50 CHECK ROLLERS
60 CHECK ELECTRICAL WIRING & HOOK UP
70 GENERAL INSPECTION

58 BSL-2352 MONTHLY 22' BOAT TRAILER MAINT. & INSP. B2AS-MA 1 MONTHS
Next 6/22/12 Next Job BSL-15048 Use Target Start: Y

BSL-15048 MONTHLY 22' BOAT TRAILER MAINT. & INSP. 1

10 CHECK HITCH
20 CHECK SAFETY CHAINS
30 CHECK WINCH & CABLE
40 CHECK TIE DOWN STRAPS
50 CHECK ROLLERS
60 CHECK SUSPENSION
70 CHECK FRAME FOR CRACKS
80 CHECK TRAILER LIGHTS
90 CHECK WHEEL BEARINGS & BEARING BUDDY
100 CHECK REFLECTORS
110 CHECK WIRING HARNESS
120 CHECK TIRES

End of Asset B2ASXFBBT

B2ASXFBEX 22' Express w/ 115 HP Yamaha

59 BSL-1407 MONTHLY 22' BOAT AND MOTOR MAINT. & INSP. B2AS-MA 1 MONTHS
Next 6/22/12 Next Job BSL-13680 Use Target Start: Y

BSL-13680 MONTHLY 22' BOAT AND MOTOR MAINT. & INSP. 1

10 CHECK FLOATION
20 INSPECT LINES
30 CHECK FUEL AND OIL
40 CLEAN AND PAINT AS NEEDED
50 CHECK FIRE EXTINGUISHER
60 CHECK AND START MOTOR
70 CHECK PROP

End of Asset B2ASXFBEX

B2ASXFBEZ 14' EZ Loader Boat Trailer

60 BSL-2349 YEARLY 14' BOAT TRAILER MAINT. & INSP. B2AS-MA 1 YEARS
Next 6/9/13 Next Job BSL-15043 Use Target Start: Y

BSL-15043 YEARLY 14' BOAT TRAILER MAINT. & INSP. 1

10 CHECK LIGHTS
20 CHECK HITCH
30 CHECK TIRES
40 CHECK BEARINGS
50 CHECK ROLLERS
60 CHECK ELECTRICAL WIRING AND HOOK UP
70 GENERAL INSPECTIONS

61 BSL-2351 MONTHLY 14' BOAT TRAILER MAINT. & INSP. B2AS-MA 1 MONTHS
Next 6/22/12 Next Job BSL-15047 Use Target Start: Y
BSL-15047 MONTHLY 14' BOAT TRAILER MAINT. & INSP. 1
10 CHECK HITCH
20 CHECK SAFETY CHAINS
30 CHECK WINCH AND CABLE
40 CHECK TIE DOWN STRAPS
50 CHECK ROLLERS
60 CHECK SUSPENSION
70 CHECK FRAME FOR CRACKS
80 CHECK TRAILER LIGHTS
90 CHECK WHEEL BEARINGS AND BEARING BUDDYS
100 CHECK REFLECTORS
110 CHECK WIRING HARNESS
120 CHECK TIRES
End of Asset B2ASXFBEZ

B2ASXFO Barges

62 BSL-1405 180 DAYS WORK BARGE MAINT. & INSP. B2AS-MA 180 DAYS
Next 12/3/12 Next Job BSL-13678 Use Target Start: Y
BSL-13678 180 DAY WORK BARGE MAINT. & INSP. 1
10 CHECK FLOATION
20 CHECK MOORING LINES
30 CHECK FOR CRACKS AND LOOSE RIVETS
40 CHECK WELDS
50 CLEAN AND PAINT AS REQUIRED
60 MAKE REPAIRS AS NEEDED
End of Asset B2ASXFO

B2ASXM Mobile Equipment

No PMs for B2ASXM

B2ASXMH Heavy Equipment

No PMs for B2ASXMH

B2ASXMT Tractors

No PMs for B2ASXMT

B2ASXMTBB Box Blade (2)

63 BSL-1422 GRADER BOX MAINTANENCE INSPECTION B2AS-MA 1 YEARS
Next 10/16/12 Next Job BSL-13699 Use Target Start: Y
BSL-13699 GRADER BOX MAINTANENCE INSPECTION 1
10 CHECK BLADE FOR CRACKS
20 CHECK BOX FOR CRACKS
30 CHECK HITCH
40 CLEAN AS NECESSARY
End of Asset B2ASXMTBB

B2ASXMTBU Backhoe Unit

64 BSL-1408 180 DAYS BACKHOE UNIT MAINT. & INSP. B2AS-MA 180 DAYS
Next 11/23/12 Next Job BSL-13681 Use Target Start: Y
BSL-13681 180 DAYS BACKHOE MAINT. & INSP. 1
10 CHECK HYDRAULIC LINES REPLACE AS NEEDED
20 CHECK BOLTS ON UNIT
30 GREASE BEFORE USE
40 CLEAN AS NEEDED
50 INSPECT BUCKET TEETH
60 CHECK ALL CONTROL OPERATIONS BEFORE USE
70 OPERATE SLOWLY BEFORE PUTTING UNDER FULL LOAD
End of Asset B2ASXMTBU

B2ASXMTFE Front End Loader

65 BSL-1409 180 DAYS FRONT END LOADER MAINT. & INSP. B2AS-MA 180 DAYS
Next 11/23/12 Next Job BSL-13682 Use Target Start: Y
BSL-13682 180 DAYS FRONT END LOADER MAINT. & INSP. 1
10 CHECK HYDRAULIC LINES

20 CHECK BOLTS
30 GREASE BEFORE USE
40 CLEAN AS NEEDED
50 CHECK ALL CONTROL OPERATIONS
60 OPERATE SLOWLY BEFORE PUTTING UNDER FULL LOAD

End of Asset B2ASXMTFE

B2ASXMTJM 6' John Deere Mower

No PMs for B2ASXMTJM

B2ASXMTNH New Holland Tractor- 55HP

66 BSL-2037 WEEKLY TRACTOR MAINT. & INSP. B2AS-MA 1 WEEKS
Next 6/11/12 Next Job BSL-14793 Use Target Start: Y
BSL-14793 WEEKLY TRACTOR MAINT. & INSP. 1
10 WEEKLY CHECKS
20 CHECK ALL MOVING PARTS
30

67 BSL-2038 180 DAYS TRACTOR MAINT. & INSP. B2AS-MA 180 DAYS
Next 11/23/12 Next Job BSL-14794 Use Target Start: Y
BSL-14794 180 DAYS TRACTOR MAINT. & INSP. 1
10 LUBRICATE TRACTOR
20 CHECK COOLING SYSTEM
30 CHANGE OIL AND FILTERS AS NEEDED
40 CHECK BATTERY

68 BSL-2040 YEARLY TRACTOR MAINT. & INSP. B2AS-MA 1 YEARS
Next 10/5/12 Next Job BSL-14795 Use Target Start: Y
BSL-14795 YEARLY TRACTOR MAINT. & INSP. 1
10 DRAIN AND FLUSH COOLING SYSTEM
20 CHANGE HYDRAULIC OIL AND FILTER
30 CHANGE FUEL FILTER

End of Asset B2ASXMTNH

B2ASXMTSB Scraper Blade

69 BSL-1419 YEARLY GRADER BLADE MAINT. & INSP. B2AS-MA 1 YEARS
Next 10/16/12 Next Job BSL-13697 Use Target Start: Y
BSL-13697 YEARLY GRADER BLADE MAINT. & INSP. 1
10 CHECK BLADE FOR CRACKS
20 CHECK HITCH
30 CLEAN AS REQUIRED
40 CHECK BLADE PIVOTS

End of Asset B2ASXMTSB

B2ASXMV Vehicles

No PMs for B2ASXMV

B2ASXMVFP Chevrolet Pick Up Truck

No PMs for B2ASXMVFP

B2ASXMVJG John Deere Gator

70 BSL-2353 WEEKLY JOHN DEERE GATOR CHECKS B2AS-MA 0 WEEKS
Next Next Job BSL-15049 Use Target Start: Y
BSL-15049 WEEKLY JOHN DEERE GATOR CHECKS 1
10 DAILY JOHN DEERE GATOR CHECKS

71 BSL-2354 3 MONTH JOHN DEERE GATOR CHECKS B2AS-MA 3 MONTHS
Next 4/20/10 Next Job BSL-15050 Use Target Start: Y
BSL-15050 3 MONTHLY JOHN DEERE GATOR CHECKS 1
10 CHECK AND TIGHTEN HARDWARE
20 CHECK DRIVE BELT CONDITION AND TENSION
30 CHECK BATTERY
40 CHECK WEAR PADS ON DRIVE CLUTCH
50 CHECK DRIVE TRAIN TENSION
60 CHECK RADIATOR SCREEN
70 CHECK AIR INTAKE TUBE
80 LUBRICATE FRONT KING PINS
90 LUBRICATE DRIVE CHAIN

100 LUBRICATE AXLE COUPLERS
110 CLEAN ENGINE COOLING FINS

72 BSL-2355 6 MONTH JOHN DEERE GATOR CHECKS B2AS-MA 6 MONTHS
Next 4/19/10 Next Job BSL-15051 Use Target Start: Y
BSL-15051 6 MONTH JOHN DEERE GATOR CHECKS 1
10 CHANGE ENGINE OIL AND FILTERS
20 CHECK TRANSAXLE LEVEL
30 CHECK AIR CLEANER DUST UNLOADING VALVE
40 CHECK AIR CLEANER ELEMENT AND CHANGE AS NEEDED
50 CHECK SPARK PLUG

73 BSL-2356 9 MONTH JOHN DEERE GATOR CHECKS B2AS-MA 9 MONTHS
Next 3/9/10 Next Job BSL-15052 Use Target Start: Y
BSL-15052 9 MONTH JOHN DEERE GATOR CHECKS 1
10 CHECK AND TIGHTEN BOLTS TO CORRECT TORQUE
20 CLEAN PRIMARY DRIVE CLUTCH
30 ADJUST ENGINE VALVE CLEARANCE

74 BSL-2357 YEARLY JOHN DEERE GATOR CHECKS B2AS-MA 1 YEARS
Next 4/19/10 Next Job BSL-15053 Use Target Start: Y
BSL-15053 YEARLY JOHN DEEERE GATOR CHECKS 1
10 CHANGE FUEL FILTER
20 CHANGE ENGINE COOLANT

End of Asset B2ASXMVJG

B2ASXMVK2 Kawasaki Mule #2

75 BSL-2364 WEEKLY KAWASAKI MULE 3010 MAINT. & INSP. B2AS-MA 1 WEEKS
Next 6/11/12 Next Job BSL-15060 Use Target Start: Y
BSL-15060 WEEKLY KAWASAKI MUEL 3010 MAINT. & INSP. 1
10 WEEKLY INSPECTIONS

76 BSL-2365 YEARLY KAWASAKI MULE 3010 MAINT. & INSP. B2AS-MA 1 YEARS
Next 12/9/12 Next Job BSL-15061 Use Target Start: Y
BSL-15061 YEARLY KAWASAKI MULE 3010 MAINT. & INSP. 1
10 CHECK CONVERTER BELT
20 CLEAN AND GAP SPARK PLUG
30 CLEAN AIR CLEANER ELEMENT
40 ADJUST IDLE SPEED
50 CHECK SPARK ARRESTER
60 CLEAN RADIATOR
70 CHECK STEERING
80 CHECK STEERING AND DRIVE SHAFT DUST BOOTS
90 CHECK BRAKE PEDAL PLAY
100 CHECK BRAKE HOSE AND PIPE
110 CHECK BRAKE FLUID LEVEL
120 CHECK BRAKE WEAR
130 CHECK TIRES
140 CHECK BATTERY
150 LUBRICATE
160 GENERAL INSPECTION

77 BSL-2367 3 MONTH KAWASAKI MULE 3010 MAINT. B2AS-MA 3 MONTHS
Next 7/11/12 Next Job BSL-15062 Use Target Start: Y
BSL-15062 3 MONTH KAWASAKI MULE 3010 MAINT. 1
10 CHECK CONVERTER DRIVEN PULLEY SHOE
20 CHECK VALVE CLEARANCE
30 CHECK THROTTLE PLAY
40 CHECK FUEL SYSTEM CLEANLINESS
50 CHECK RADIATOR HOSE AND CONNECTION

78 BSL-2369 YEARLY KAWASAKI MULE 3010 MAINT. B2AS-MA 1 YEARS
Next 6/19/12 Next Job BSL-15063 Use Target Start: Y
BSL-15063 YEARLY KAWASAKI MULE 3010 MAINT. 1
10 CHANGE ENGINE OIL
20 CHECK RADIATOR HOSE AND CONNECTIONS
30 CHANGE OIL IN FRONT FINAL GEAR CASE
40 CHANGE OIL IN TRANSMISSION CASE

79 BSL-2371 2 YEAR KAWASAKI MULE 3010 MAINT. B2AS-MA 2 YEARS

Next 6/7/14 Next Job BSL-15064 Use Target Start: Y

BSL-15064 2 YEAR KAWASAKI MULE 3010 MAINT. 1

10 CHANGE ENGINE COOLANT
20 CHANGE BRAKE FLUID
30 REPLACE MASTER BRAKE CYLINDER CUP AND DUST SEAL
40 REPLACE BRAKE WHEEL CYLINDER ASSEMBLY

80 BSL-2373 4 YEAR KAWASAKI MULE 3010 MAINT. B2AS-MA 4 YEARS

Next 6/7/16 Next Job BSL-15066 Use Target Start: Y

BSL-15066 4 YEAR KAWASAKI MULE 3010 MAINT. 1

10 REPLACE FUEL HOSE
20 REPLACE BRAKE HOSE

End of Asset B2ASXMVK2

B2ASXMVM1 Kawasaki Mule #1

81 BSL-2358 WEEKLY KAWASAKI MULE 4010 MAINT. & INSP. B2AS-LO 1 WEEKS

Next 6/17/12 Next Job BSL-15054 Use Target Start: Y

BSL-15054 WEEKLY KAWASAKI MULE 4010 MAINT. & INSP. 1

10 WEEKLY MULE INSPECTIONS

82 BSL-2359 YEARLY KAWASAKI MULE 4010 MAINT. & INSP. B2AS-MA 1 YEARS

Next 1/5/13 Next Job BSL-15055 Use Target Start: Y

BSL-15055 YEARLY KAWASAKI MULE 4010 MAINT. & INSP. 1

10 MONTHLY CHECKS

83 BSL-2360 3 MONTH KAWASAKI MULE 4010 MAINT. & INSP. B2AS-MA 3 MONTHS

Next 7/5/12 Next Job BSL-15056 Use Target Start: Y

BSL-15056 3 MONTH KAWASAKI MULE 4010 MAINT. & INSP. 1

10 CHECK CONVERTER DRIVEN PULLEY SHOE
20 CHECK VALVE CLEARANCE
30 CHECK THROTTLE PLAY
40 CHECK FUEL SYSTEM CLEANLINESS
50 CHECK RADIATOR HOSES AND CONNECTIONS

84 BSL-2361 YEARLY KAWASAKI MULE 4010 MAINT. & INSP. B2AS-MA 1 YEARS

Next 1/5/13 Next Job BSL-15057 Use Target Start: Y

BSL-15057 YEARLY KAWASAKI MULE 4010 MAINT. & INSP. 1

10 CHANGE ENGINE OIL AND FILTER
20 CHECK RADIATOR HOSES AND CONNECTIONS
30 CHANGE OIL IN FRONT FINAL GEAR CASE
40 CHANGE OIL IN TRANSMISSION CASE

85 BSL-2362 2 YEAR KAWASAKI MULE 4010 MAINT. B2AS-MA 2 YEARS

Next 1/5/14 Next Job BSL-15058 Use Target Start: Y

BSL-15058 2 YEAR KAWASAKI MULE 4010 MAINT. 1

10 CHANGE ENGINE COOLANT
20 CHANGE BRAKE FLUID
30 REPLACE MASTER BRAKE CYLINDER CUP AND DUST SEAL
40 REPLACE BRAKE WHEEL CYLINDER ASSEMBLY

86 BSL-2363 4 YEAR KAWASAKI MULE 4010 MAINT. B2AS-MA 4 YEARS

Next 1/5/14 Next Job BSL-15059 Use Target Start: Y

BSL-15059 4 YEAR KAWASAKI MULE 4010 MAINT. 1

10 REPLACE FUEL HOSE
20 REPLACE BRAKE HOSE

End of Asset B2ASXMVM1

B2ASXQ Supporting Equipment

87 BSL-1466 MONTHLY CHAIN SAW MAINT. & INSP. B2AS-MA 1 MONTHS

Next 7/9/12 Next Job BSL-13787 Use Target Start: Y

BSL-13787 MONTHLY CHAIN SAW MAINT. & INSP. 1

10 RUN CHAIN SAW
20 CHECK OIL FOR CHAIN & ADD IF NEEDED
30 CHECK FOR LOOSE NUTS AND BOLTS
40 CHECK CHAIN FOR WEAR AND TEAR
50 CHECK CHAIN BAR FOR CRACKS OR BREAKS
60 REPLACE CHAIN AND CHAIN BAR AS NEEDED
70 CHANGE FILTERS AS NEEDED

88 BSL-1505 180 DAY PORTABLE HEATER MAINT. & INSP. B2AS-MA 180 DAYS
Next Date 8/30/12 Next Job BSL-13914 Use Target Start: Y
BSL-13914 180 DAY PORTABLE HEATER MAINT. & INSP. 1
10 CHECK WIRING
20 CHECK & CLEAN FAN BLADES
30 CHECK HEATING COIL
40 CHECK LEG SUPPORTS
50 CHECK SAFETY FEATURES
60 CLEAN UNIT
70 REPAIR AS NEEDED

89 BSL-1687 180 -DAY SPACE HEATERS MAINTENANCE & INSPECTION B2AS-MA 180 DAYS
Next Date 11/4/12 Next Job BSL-14253 Use Target Start: Y
BSL-14253 180 DAY SPACE HEATERS MAINTENANCE & INSPECTION 1
10 CHECK HEATER COILS
20 CHECK ELECTRIC CORDS
30 CHECK THERMOSTAT CONTROLS
40 CLEAN AS NEEDED

90 BSL-1938 MONTHLY REFRIGERATOR MAINT. & INSP. B2AS-MA 1 MONTHS
Next Date 6/22/12 Next Job BSL-14538 Use Target Start: Y
BSL-14538 MONTHLY REFRIGERATOR MAINT. & INSP. 1
10 CHECK WIRING AND MOTOR
20 DEFROST AS NEEDED
30 CLEAN
40 GENERAL INSPECTION

91 BSL-1940 MONTHLY ELECTRIC STOVE MAINT. & INSP. B2AS-MA 1 MONTHS
Next Date 7/9/12 Next Job BSL-14541 Use Target Start: Y
BSL-14541 MONTHLY ELECTRIC STOVE MAINT. & INSP. 1
10 CHECK WIRING
20 CLEAN OVEN AND COOK TOP
30 GENERAL INSPECTION

92 BSL-1942 180 DAY SHOP VAC MAINT. & INSP. B2AS-MA 180 DAYS
Next Date 10/3/12 Next Job BSL-14548 Use Target Start: Y
BSL-14548 180 DAY SHOP VAC MAINT. & INSP. 1
10 CHECK ELECTRICAL CORD
20 CHECK ATTACHMENTS
30 EMPTY AND CLEAN CONTAINER AS NEEDED
40 WASH FILTER
50 CLEAN OUTSIDE OF UNIT

End of Asset B2ASXQ

B2ASXQ3P 3" Water Pump

93 BSL-1404 MONTHLY 3" DIESEL WATER PUMP MAINT. & INSP. B2AS-MA 1 MONTHS
Next Date 7/9/12 Next Job BSL-13677 Use Target Start: Y
BSL-13677 MONTHLY 3" DIESEL WATER PUMP MAINT. & INSPECTION 1
10 CHECK FUEL
20 CHECK OIL AND ADD IF NEEDED
30 CHECK SUCTION AND DISCHARGE HOSES
40 CLEAN AS NEEDED
50 START PUMP
60 MAKE REPAIRS AS NEEDED

End of Asset B2ASXQ3P

B2ASXQAB Air Blower

No PMs for B2ASXQAB

B2ASXQAC 30 Gal Air Compressor

94 BSL-1435 MONTHLY AIR COMPRESSOR (ELECTRICAL) MAINT. & INSP. B2AS-MA 1 MONTHS
Next Date 7/9/12 Next Job BSL-13715 Use Target Start: Y
BSL-13715 MONTHLY AIR COMPRESSOR (ELECTRIC) MAINT. & INSP. 1
10 CHECK OIL IN COMPRESSOR - CHANGE IF NEEDED
20 CHECK ELECTRICAL CONNECTIONS
30 CHECK COMPRESSOR BELTS
40 CHECK HOSES AND FITTINGS FOR LEAKS

50 DRAIN WATER FROM AIR TANK
60 CHECK MOVING PARTS WHILE RUNNING
70 MAKE REPAIRS AS NEEDED

End of Asset B2ASXQAC

B2ASXQAT Air Tools

95 BSL-1488 MONTHLY AIR TOOLS MAINT. & INSP. B2AS-MA 1 MONTHS
Next Date 7/9/12 Next Job BSL-13848 Use Target Start: Y

BSL-13848 MONTHLY AIR TOOLS MAINT. & INSP. 1

10 MAINTENANCE AND INSPECTION
20 CHECK CONDITION OF TOOLS
30 CHECK FOR CRACKS OR BREAKS IN CASING
40 CHECK AIR HOSE FITTINGS
50 REPLACE OR REPAIR AS NEEDED

End of Asset B2ASXQAT

B2ASXQBC Battery Charger

96 BSL-1439 MONTHLY BATTERY CHARGER MAINT. & INSP. B2AS-MA 1 MONTHS
Next Date 7/9/12 Next Job BSL-13736 Use Target Start: Y

BSL-13736 MONTHLY BATTERY CHARGER MAINT. & INSP. 1

10 CHECK ELECTRICAL CORD
20 CHECK CHARGING LEADS
30 CLEAN AND REPAIR AS NEEDED
40 CHECK OPERATION OF UNIT

End of Asset B2ASXQBC

B2ASXQBG Electric Bilge Pumps

No PMs for B2ASXQBG

B2ASXQBP Back Pack Sprayer

97 BSL-1501 YEARLY BACK PACK SPRAYER MAINT. & INSP. B2AS-MA 1 YEARS
Next Date 12/9/12 Next Job BSL-13892 Use Target Start: Y

BSL-13892 YEARLY BACK PACK SPRAYER MAINT. & INSP. 1

10 CHECK PUMP
20 CHECK TANK
30 CHECK HOSE
40 CHECK NOZZLE
50 CLEAN AFTER USE

End of Asset B2ASXQBP

B2ASXQBW Bobcat Welding Machine

No PMs for B2ASXQBW

B2ASXQET Electrical Tools

98 BSL-1443 MONTHLY TABLE BANDSAW INSPECTION B2AS-MA 1 MONTHS
Next Date 7/9/12 Next Job BSL-13738 Use Target Start: Y

BSL-13738 MONTHLY TABLE BANDSAW INSPECTION 1

10 CHECK POWER CORD FOR DEFECTS
20 CHECK SAW BLADE FOR BROKEN TEETH
30 CHECK SAFETY GAURDS FOR PROPER PLACEMENT
40 CLEAN AS NEEDED
50

99 BSL-1467 MONTHLY DRILL/MILLING MACHINE MAINT. & INSP. B2AS-MA 1 MONTHS
Next Date 7/9/12 Next Job BSL-13790 Use Target Start: Y

BSL-13790 MONTHLY DRILL/MILLING MACHINE MAINT. & INSP. 1

10 CHECK ELECTRICAL CORD
20 CHECK DRILL CHUCK
30 GREASE SHAFT
40 CHECK BELTS
50 CLEAN AS NEEDED

100 BSL-1469 MONTHLY GRINDER/BUFFER MAINT. & INSP. B2AS-MA 1 MONTHS
Next Date 7/9/12 Next Job BSL-13791 Use Target Start: Y

BSL-13791 MONTHLY GRINDER/BUFFER MAINT. & INSP. 1

10 CHECK WIRING
20 CHECK GRINDING STONE FOR CRACKS

30 CHECK WIRE BRUSH
40 REPLACE GRINDING STONE AND WIRE BRUSH AS NEEDED

101 BSL-1470 180 DAYS SHOP FAN MAINT. & INSP. B2AS-MA 180 DAYS
Next Date 11/20/12 Next Job BSL-13793 Use Target Start: Y
BSL-13793 180 DAYS SHOP FAN MAINT. & INSP, 1
10 CHECK AND CLEAN FAN BLADES
20 CHECK MOTOR
30 CHECK ELECTRICAL CORD
40 MAKE GENERAL INSPECTION AND CLEAN IF NEEDED
50 REPAIR AS NEEDED

102 BSL-1481 MONTHLY ELECTRICAL TOOLS MAINT. & INSP. B2AS-MA 1 MONTHS
Next Date 7/9/12 Next Job BSL-13832 Use Target Start: Y
BSL-13832 MONTHLY ELECTRICAL TOOLS MAINT. & INSP. 1
10 MAINTENANCE AND INSPECTION
20 INSPECT ELECTRIC CORDS
30 INSPECT FOR CRACKS OR BREAKS IN CASINGS
40 REPLACE AS NEEDED
50 CLEAN AFTER USE

103 BSL-1697 MONTHLY COMPOUND MITER SAW MAINT. & INSP. B2AS-MA 1 MONTHS
Next Date 7/9/12 Next Job BSL-14255 Use Target Start: Y
BSL-14255 MONTHLY COMPOUND MITER SAW MAINT. & INSP. 1
10 CHECK BLADE FOR CRACKS OR DAMAGE
20 CHANGE BLADE AS NEEDED
30 CHECK ELECTRICAL CORD FOR BREAKS OR CRACKS
40 CHECK THAT SAFETY GUARDS ARE IN PLACE.
50 REPAIR AS NEEDED
60 CLEAN AFTER EACH USE

End of Asset B2ASXQET

B2ASXQGG Grease Gun

No PMs for B2ASXQGG

B2ASXQGN Portable Generator

No PMs for B2ASXQGN

B2ASXQHT Hand Tools

104 BSL-1472 MONTHLY HAND TOOLS MAINT. & INSP. B2AS-MA 1 MONTHS
Next Date 7/9/12 Next Job BSL-13810 Use Target Start: Y
BSL-13810 MONTHLY HAND TOOLS MAINT. & INSP. 1
10 CHECK FOR CRACKS OR BREAKS
20 REPLACE OR REPAIR AS NEEDED
30 INSPECT GENERAL CONDITION

105 BSL-1500 YEARLY 2 GAL. SPRAYER MAINT. & INSP. B2AS-MA 1 YEARS
Next Date 12/9/12 Next Job BSL-13886 Use Target Start: Y
BSL-13886 YEARLY 2 GAL. SPRAYER MAINT. & INSP. 1
10 CHECK PUMP
20 CHECK TANK
30 CHECK HOSE
40 CHECK NOZZLE
50 CLEAN TANK AFTER USE

106 BSL-1690 YEARLY HOISTING EQUIPMENT MAINTENANCE & INSPECTION B2AS-MA 1 YEARS
Next Date 12/3/12 Next Job BSL-14254 Use Target Start: Y
BSL-14254 YEARLY HOISTING EQUIPMENT MAINTENANCE & INSPECTION 1
10 CHECK TO MAKE SURE EQUIPMENT WORKS PROPERLY
20 OIL ALL MOVING PARTS
30

107 BSL-1944 YEARLY BENCH VISE MAINT. & INSP. B2AS-MA 1 YEARS
Next Date 11/13/12 Next Job BSL-14551 Use Target Start: Y
BSL-14551 YEARLY BENCH VISE MAINT. & INSPC. 1
10 CHECK FOR CRACKS OR BREAKS
20 CHECK VISE SCREW FOR EASE OF MOVEMENT
30 CLEAN AND OIL AS REQUIRED

End of Asset B2ASXQHT

B2ASXQLC Large Cutting Unit

108 BSL-1432 MONTHLY OXYGEN/ACETYLENE UNIT MAINT. & INSP. B2AS-MA 1 MONTHS
Next Date 7/9/12 Next Job BSL-13711 Use Target Start: Y

BSL-13711 MONTHLY OXYGEN/ACETYLENE UNIT MAINT. & INSP. 1

10 CHECK HOSES AND FITTINGS
20 CHECK PROPER SETTINGS ON GAUGES
30 REPLACE EMPTY BOTTLES
40 CHECK CUTTING TORCH
50 INSURE SAFETY EQUIPMENT IN ORDER
60 CHECK FIRE EXTINGUISHER
70 REPLACE ITEMS AS NEEDED

End of Asset B2ASXQLC

B2ASXQLS Portable Light Stands

No PMs for B2ASXQLS

B2ASXQMW Miller Wire Feed Welding Machine

No PMs for B2ASXQMW

B2ASXQNA Air Compressor, Control House

109 BSL-1434 MONTHLY AIR COMPRESSOR - NORTH END CONTROL HOUSE B2AS-MA 1 MONTHS
Next Date 1/16/11 Next Job BSL-13714 Use Target Start: Y

BSL-13714 MONTHLY AIR COMPRESSOR - NORTH END CONTROL HOUSE 1

10 CHECK ELECTRICAL CONNECTIONS
20 CHECK AIR HOSE
30 DRAIN WATER FROM TANK
40 CHECK OPERATION OF UNIT

End of Asset B2ASXQNA

B2ASXQPA Portable Air Compressor

110 BSL-1436 MONTHLY AIR COMPRESSOR (PORTABLE) MAINT. & INSP. B2AS-MA 1 MONTHS
Next Date 7/9/12 Next Job BSL-13716 Use Target Start: Y

BSL-13716 MONTHLY AIR COMPRESSOR (PORTABLE) MAINT. & INSPECTION 1

10 CHECK OIL IN COMPRESSOR
20 CHECK OIL IN ENGINE
30 CHECK GAS
40 CHECK AIR FILTER ON COMPRESSOR - CLEAN AS NEEDED
50 CHECK AIR FILTER ON ENGINE - CLEAN AS NEEDED
60 CHECK COMPRESSOR GUARD - TIGHTEN GUARD IF NEEDED
70 CHECK FOR OIL AND AIR LEAKS
80 CHECK ALL FITTINGS
90 CHECK HOSES
100 DRAIN WATER FROM AIR TANK
110 CHANGE OIL & FILTERS AS NEEDED

111 BSL-1437 180 DAY AIR COMPRESSOR (PORTABLE) MAINT. & INSP. B2AS-MA 180 DAYS
Next Date 7/19/12 Next Job BSL-13844 Use Target Start: Y

BSL-13844 180 DAY PORTABLE AIR COMPRESSOR MAINT. & INSP. 1

10 CHANGE ENGINE OIL
20 CLEAN GAS BOWL
30 CHECK AND CLEAN SPARK PLUG
40 CLEAN SPARK ARRESTOR

112 BSL-1438 YEARLY AIR COMPRESSOR (PORTABLE) MAINT. & INSP. B2AS-MA 1 YEARS
Next Date 6/11/12 Next Job BSL-13720 Use Target Start: Y

BSL-13720 YEARLY AIR COMPRESSOR (PORTABLE) MAINT. & INSP. 1

10 CLEAN FUEL TANK AND STRAINER
20 CHECK FUEL HOSE AND REPLACE IF NEEDED

End of Asset B2ASXQPA

B2ASXQPM Powermax Plasma Cutter

No PMs for B2ASXQPM

B2ASXQPR Pressure Washer

113 BSL-1936 MONTHLY PRESSURE WASHER MAINT. & INSP. B2AS-MA 1 MONTHS

Next 6/11/12 Next Job BSL-14534 Use Target Start: Y

BSL-14534 MONTHLY PRESSURE WASHER MAINT. & INSP. 1

10 CHECK OIL IN MOTOR AND PUMP
20 CHECK GAS
30 CHECK PULL CORD
40 CHECK HOSE AND FITTINGS
50 RUN WEEKLY
60 CLEAN AFTER EACH USE

End of Asset B2ASXQPR

B2ASXQPS Portable Sandblaster

No PMs for B2ASXQPS

B2ASXQPT Power Tools

114 BSL-1425 MONTHLY WEED EATER MAINTENANCE & INSPECTION B2AS-MA 1 MONTHS

Next 7/9/12 Next Job BSL-13700 Use Target Start: Y

BSL-13700 MONTHLY WEED EATER MAINTENANCE & INSPECTION 1

10 CHECK OIL
20 CHECK GAS
30 CHECK STRING
40 CHECK FOOTING FOR LOOSE OR BROKEN PARTS
50 RUN
60 CLEAN
70

115 BSL-1477 MONTHLY BATTERY OPERATED TOOLS MAINT. & INSP. B2AS-MA 1 MONTHS

Next 7/9/12 Next Job BSL-13831 Use Target Start: Y

BSL-13831 MONTHLY BATTERY OPERATED TOOLS MAINT. & INSP. 1

10 MAINTENANCE AND INSPECTIONS

116 BSL-1941 MONTHLY TABLE SAW MAINT. & INSP. B2AS-MA 1 MONTHS

Next 7/9/12 Next Job BSL-14544 Use Target Start: Y

BSL-14544 MONTHLY TABLE SAW MAINT. & INSP. 1

10 CHECK THAT SAFETY GUARDS IN PLACE.
20 CHECK BLADE FOR CRACKS OR BREAKS
30 CHECK ELECTRICAL CORD FOR CRACKS OR CUTS
40 WEAR SAFETY GLASSEES WHEN USING
50 CHECK MOTOR MOUNTING BRACKET AND ADJUST AS NEEDED
60 CLEAN AFTER EACH USE

End of Asset B2ASXQPT

B2ASXQPU Spray Paint Unit

117 BSL-1935 180 DAY PAINT SPRAYER MAINT. & INSP. B2AS-MA 180 DAYS

Next 11/5/12 Next Job BSL-14529 Use Target Start: Y

BSL-14529 180 DAY PAINT SPRAYER MAINT. & INSP. 1

10 CHECK HOSE CONNECTIONS
20 CHECK HOSES FOR CRACKS OR CUTS - REPLACE AS NEEDED
30 CHECK GASKET ON SPRAY POT FOR GOOD SEAL
40 CHECK SPRAY GUN AND CLEAN AFTER EACH USE
50 CHECK THAT GAUGES IN GOOD WORKING ORDER
60 CLEAN POT AND GUN AFTER EACH USE.

End of Asset B2ASXQPU

B2ASXQPW Pow Con Welding Machine

No PMs for B2ASXQPW

B2ASXQSC Small Cutting Unit

118 BSL-1433 MONTHLY PORTABLE OXYGEN/ACETYLENE UNIT MAINT. & INSP. B2AS-MA 1 MONTHS

Next 7/9/12 Next Job BSL-13712 Use Target Start: Y

BSL-13712 MONTHLY PORTABLE OXYGEN/ACETYLENE UNIT MAINT. & INSP. 1

10 CHECK HOSES
20 CHECK BOTTLE CONNECTIONS
30 CHECK SETTINGS ON GAUGES
40 REPLACE EMPTY BOTTLES
50 CHECK TORCH IN GOOD OPERATING MANNER
60 CHECK SAFETY EQUIPMENT

70 REPLACE PARTS AS NEEDED

End of Asset B2ASXQSC

B2ASXQSM Sump Pumps

No PMs for B2ASXQSM

B2ASXQST Spray Tank

119 BSL-1937 MONTHLY 15 GAL. SPRAYER MAINT. & INSP. B2AS-MA 1 MONTHS
Next Date 6/24/12 Next Job BSL-14536 Use Target Start: Y

BSL-14536 MONTHLY 15 GAL. SPRAYER MAINT. & INSP. 1

10 CHECK HITCH
20 CHECK PUMP
30 CHECK HOSES AND NOZZLE
40 CHECK ELECTRICAL CONNECTIONS
50 CLEAN AFTER EACH USE

End of Asset B2ASXQST

B2ASXQUT 20' Utility Trailer

120 BSL-2384 MONTHLY 20' UTILITY TRAILER MAINT. & INSP. B2AS-MA 1 MONTHS
Next Date 6/20/12 Next Job BSL-15089 Use Target Start: Y

BSL-15089 MONTHLY 20' UTILITY TRAILER MAINT. & INSP. 1

10 CHECK LIGHTS
20 CHECK HITCH
30 CHECK TIRES
40 CHECK WHEEL BEARINGS
50 CHECK WIRING HARNESS
60 GENERAL INSPECTION

121 BSL-2385 YEARLY 20' UTILITY TRAILER INSP. B2AS-MA 1 YEARS
Next Date 10/26/12 Next Job BSL-15091 Use Target Start: Y

BSL-15091 YEARLY 20' UTILITY TRAILER INSP. 1

10 CHECK TRAILER DECKING AND CHANGE AS NEEDED
20 CHECK LIGHTS AND WIRING HARNESS
30 CHECK TIRES AND WHEEL BEARINGS
40 CHECK TRAILER HITCH
50 GENERAL INSPECTION

End of Asset B2ASXQUT

B2ASXQWA Water Pump

No PMs for B2ASXQWA

B2ASXQWD Wash Down Pump

122 BSL-2427 MONTHLY FIRE PUMP MAINT. & INSP. B2AS-MA 1 MONTHS
Next Date 7/8/12 Next Job BSL-15175 Use Target Start: Y

BSL-15175 MONTHLY FIRE PUMP MAINT. & INSP. 1

10 INSPECT PUMP
20 CHECK FOR OIL LEAKS
30 CHECK WATER LINE FOR LEAKS
40 RUN PUMP
50 CLEAN & PAINT AS NEEDED

End of Asset B2ASXQWD

B2ASXQWP 2" Water Pumps (2)

123 BSL-1431 WEEKLY 2" WATER PUMP MAINT. & INSP. B2AS-MA 1 WEEKS
Next Date 6/17/12 Next Job BSL-13710 Use Target Start: Y

BSL-13710 WEEKLY 2" WATER PUMP MAINT. & INSP. 1

10 CHECK OIL AND GAS
20 CHECK HOSE FITTINGS AND CONNECTIONS
30 CHANGE OIL AND FILTERS AS NEEDED
40 CLEAN UNIT

End of Asset B2ASXQWP

B2ASXQWT Welding Trailer

124 BSL-1947 WEEKLY BOBCAT WELDER MAINT. & INSP. B2AS-MA 1 WEEKS
Next Date 6/17/12 Next Job BSL-14552 Use Target Start: Y

BSL-14552 WEEKLY BOBCAT WELDER MAINT. & INSP. 1

10 CHECK WELDING LEADS
20 CHECK BATTERY AND TERMINALS
30 CHECK GAS & OIL
40 CHECK AND CLEAN SPARK ARRESTOR
50 CHECK HITCH ON TRAILER
60 CHECK SAFETY CHAINS AND LIGHTS

125 BSL-1948 90 DAY BOBCAT WELDER MAINT. & INSP. B2AS-MA 90 DAYS
Next Date 6/29/12 Next Job BSL-14553 Use Target Start: Y
BSL-14553 90 DAY BOBCAT WELDER MAINT. & INSP. 1
10 CHANGE OIL AND OIL FILTER
20 CHANGE FUEL FILTER
30 BLOW OUT OR VACUUM INSIDE OF UNIT
40 CHANGE AIR FILTER

End of Asset B2ASXQWT

B2ASXQWU Emergency Winch Units

No PMs for B2ASXQWU

B2ASXS Security

126 BSL-1387 WEEKLY SECURITY CHECKS OF FENCE LINE - EAST SIDE B2AS-MA 7 DAYS
Next Date 6/11/12 Next Job BSL-13617 Use Target Start: Y
BSL-13617 WEEKLY SECURITY CHECK OF FENCE LINE - EAST SIDE 1
10 CHECK FENCE LINE FOR BREAKS
20 FILL ANY HOLES UNDER FENCE
30 CHECK SIGNS ON FENCE

127 BSL-1390 WEEKLY SECURITY CHECK OF FENCE LINE - WEST SIDE B2AS-MA 7 DAYS
Next Date 6/17/12 Next Job BSL-13620 Use Target Start: Y
BSL-13620 WEEKLY SECURITY CHECK OF FENCE LINE - WEST SIDE 1
10 CHECK FENCE LINE FOR BREAKS
20 FILL ANY HOLES UNDER FENCE
30 CHECK SIGNS ON FENCE

End of Asset B2ASXS

B2ASXSG Security Gates

No PMs for B2ASXSG

B2ASXSGEG Eastside Entrance Gate

128 BSL-1384 MONTHLY EAST SIDE ENTRANCE GATE MAINT. & INSP. B2AS-MA 1 MONTHS
Next Date 7/9/12 Next Job BSL-13613 Use Target Start: Y
BSL-13613 MONTHLY EAST SIDE ENTRANCE GATE MAINT. & INSP. 1
10 CHECK OUT OPERATION OF GATE
20 CHECK ELECTRICAL - REPAIR AS NEEDED
30 GENERAL INSPECTION
40 MAKE REPAIRS AS NEEDED

End of Asset B2ASXSGEG

B2ASXSGEGR Entry/Exit Card Reader

No PMs for B2ASXSGEGR

B2ASXSGPF Perimeter Fence

No PMs for B2ASXSGPF

B2ASXSGWG Westside Entrance Gate

129 BSL-1383 MONTHLY WEST SIDE ENTRANCE GATE MAINT. & INSP. B2AS-MA 1 MONTHS
Next Date 7/9/12 Next Job BSL-13587 Use Target Start: Y
BSL-13587 MONTHLY WEST SIDE ENTRANCE GATE MAINT. & INSPECTION 1
10 CHECK OUT OPERATION OF GATE
20 CHECK ELECTRICAL IF NEEDED
30 GENERAL INSPECTION OF GATE
40 MAKE REPAIRS AS NEEDED

End of Asset B2ASXSGWG

B2ASXSGWGR Entry/Exit Card Reader

No PMs for B2ASXSGWGR

B2ASXSV Security Video System

No PMs for B2ASXSV

B2ASXSVCS **CCure System**

No PMs for B2ASXSVCS

B2ASXSVDR **Digital Recorder**

No PMs for B2ASXSVDR

B2ASXSVPD **Pedestal Cameras**

No PMs for B2ASXSVPD

B2ASXSVPL **Pelco Cameras**

No PMs for B2ASXSVPL

B2ASXW **Water System**

No PMs for B2ASXW

B2ASXWCW **City Water Supply System**

130 BSL-1396 MONTHLY WATER LINE MAINT. AND INSP. B2AS-MA 1 MONTHS
Next 7/9/12 Next Job BSL-13630 Use Target Start: Y

BSL-13630 MONTHLY WATER LINE MAINT. & INSPECTION 1

10 VISUAL INSPECTION OF WATER LINE FOR LEAKS AND SEEPAGE
20 REPAIR AS REQUIRED
30 WEEDEAT AND MAINTAIN AREAS AROUND GUARD RACKS

End of Asset B2ASXWCW

B2ASXWWC **Water Coolers**

131 BSL-1397 YEARLY WATER COOLER MAINT. & INSP. B2AS-MA 1 YEARS
Next 6/13/12 Next Job BSL-13633 Use Target Start: Y

BSL-13633 YEARLY WATER COOLER MAINT. & INSP. 1

10 CHECK ELECTRICAL CORD - REPLACE IF NEEDED
20 CHECK FOR LEAKS
30 CLEAN UNIT
40 OIL MOTOR

End of Asset B2ASXWWC

BSL-4030 **Hazard Waste Container**

No PMs for BSL-4030

BSL-4035 **WORK BARGE**

No PMs for BSL-4035

This report pulls all Asset records in Operating status for the Site ID and USACE Org Code specified in the parameters along with all active Preventative Maintenance records (schedules) linked to the Assets and their related Job Plans.

The Frequency and Unit fields indicate how often the PM schedule runs. Sequence indicates which Job Plan will be used every ***n*** times the PM runs. For further explanation, see your Site or District FEM POC, or consult the FEM PM Guide on the FEM SharePoint site.

Database fields used (Table.Field):
ASSET.ASSETNUM, ASSET.DESCRIPTION, PM.PMNUM, PM.DESCRIPTION, PM.FREQUENCY, PM.FREQUNIT, PM.CREWID, PM.NEXTDATE, PM.EXTDATE, PM.JPNUM, PM.USETARGETDATE, PMMETER.METERNAME, PMMETER.FREQUENCY, PMSEQUENCE.JPNUM, PMSEQUENCE.INTERVAL, JOBPLAN.DESCRIPTION

D.2. Lower Monumental Lock and Dam

PM & Jobplan Listing by Asset w/tasks

See the last page for field explanations

Site = NWW-LOM

Org Code G4R0QL0

G4-3N000000 NAVIGATION LOCK

ASSET PM / JOB PLAN / iptask		CREW / SEQUENCE	FREQUENCY
1 G4-3LIGHTNAV	NAVLOCK AREA(S) LIGHTING RELAMPING (Q)	G4-3ELECT	3 MONTHS
Next 10/1/10	Next Job G4-3LIGHTNA Use Target Start: Y		
G4-3LIGHTNAV	NAVLOCK AREA(S) LIGHTING RELAMPING Quarterly	1	
5	SAFE CLEARANCE: REVIEW AHA AND ARC FLASH REQUIREMENTS		
10	RELAMP NAVLOCK AREAS		
2 G4-3NAVLOCK	LOMO NAVLOCK MAINTENANCE -Mechanics	G4-3MECH	1 YEARS
Next 10/1/08 Ext 10/1/08	Next Job G4-3NAVLOCI Use Target Start: Y		
G4-3NAVLOCK	LOMO NAVLOCK MAINTENANCE	1	
10	UPSTREAM NORTH AREA		
20	#4 TAINTER VALVE MACHINERY ROOM		
30	UPSTREAM GATES NORTH MACHINERY ROOM		
40	UPSTREAM GATE SOUTH MACHINERY ROOM		
50	#3 TAINTER VALVE MACHINE ROOM		
60	UNWATERING PUMP 35		
70	DOWNSTREAM GATE MACHINERY ROOM***(NORTH TOWER)		
80	TAINTER VALVE MACHINERY ROOM 1&2		
90	DOWNSTREAM GATE MACHINE ROOM***(SOUTH TOWER)		
100	NON-OVERFLOW COMP ROOM		
3 G4-3NAVLOCKRI	NAVLOCK ROUNDS ELECTRICAL Electricians	G4-3ELECT	1 WEEKS
Next 7/2/12	Next Job G4-3NELECTI Use Target Start: Y		
G4-3NELECTNLR	NAV LOCK WEEKEND ROUNDS ELECTRICAL	1	
10	Tainter Emptying Valves Machinery Room		
20	Downstream Gate Machinery Room, Navlock North Tower		
30	Downstream Gate Machinery Room, Navlock South Tower		
40	Tainter Filling Valve # 4 Machinery Rooms, North Side Upstream. Power		
50	Tainter Filling Valve # 3 Machinery Rooms, South Side Upstream. Power		
60	Upstream Gate Machinery Room , Navlock North Side LCQ4		
70	Upstream Gate Machinery Room , LCQ3 Navlock South Side		
80	Check Down Stream Nav Lock Gate #1		
4 G4-3NELECTNLE	NAV LOCK WEEKEND ROUNDS - Electricians	G4-3ELECT	1 WEEKS
Next 4/7/11	Next Job G4-3NELECTI Use Target Start: Y		
G4-3NELECTNLR	NAV LOCK WEEKEND ROUNDS ELECTRICAL	1	
10	Tainter Emptying Valves Machinery Room		
20	Downstream Gate Machinery Room, Navlock North Tower		
30	Downstream Gate Machinery Room, Navlock South Tower		
40	Tainter Filling Valve # 4 Machinery Rooms, North Side Upstream. Power		
50	Tainter Filling Valve # 3 Machinery Rooms, South Side Upstream. Power		
60	Upstream Gate Machinery Room , Navlock North Side LCQ4		
70	Upstream Gate Machinery Room , LCQ3 Navlock South Side		
80	Check Down Stream Nav Lock Gate #1		
5 G4-3NEMM-EA	EMERGENCY & EGRESS LIGHTS-NAV LOCK	G4-3ELECT	1 MONTHS
Next 7/1/12	Next Job G4-3PSEMME Use Target Start: Y		
G4-3PSEMME	EMERGENCY & EGRESS LIGHTING	1	
5	CHECK SHEETS LOCATED:		
10	COORDINATE WORK WITH OPERATIONS and PLANT PERSONNEL.		
20	BEFORE STARTING OPERATIONAL TEST		
30	SECURE POWER BY PANEL BREAKER or FROM POWER SOURCE.		
40	INSTALL TEST LABEL WITH DATE and INITIAILS.		
50	EXIT SIGNS:		
60	FOLLOW ALL PROJECT SAFETY, OPERATIONAL, ARC FLASH PROCEDURES ar		
6 G4-3NWINTM	WINTERIZE PROJECT: NAVIGATION LOCK - Mechanics	G4-3MECH	6 MONTHS
Next 11/1/12	Next Job G4-3NWINTRI Use Target Start: Y		

G4-3NWINTRM-S WINTERIZE PROJECT: (LOWER MONUMENTAL)-(S) 1

10 SAFE CLEARANCE: NAVIGATION LOCK
20 NAVIGATION AREA -OCTOBER
30 NAVIGATION AREA - APRIL

End of Asset G4-3N000000

G4-3NAC1000 #1 NAV LOCK COMPRESSOR

7 G4-3DA2E COMPRESSOR: AIR # 1 LS-100 - Electricians G4-3ELECT 6 MONTHS
Next 7/1/12 Next Job G4-3DA2E-A Use Target Start: Y

G4-3DA2E-A COMPRESSOR: AIR #1 LS-1000 & REFRIGERATED Semi Annual 1

10 SAFE CLEARANCE OR SWITCHING PERMIT: SOUTH NON-OVERFLOW
20 CHECK CONTROL & POWER CIRCUITS. CHECK CONTACTS &
30 CHECK FOR LOOSE WIRE TERMINAL CONNECTIONS
40 CHECK & ADJUST PRESSURE SWITCHES, TEMPERATURE
50 LUBE MOTOR BEARINGS (IF NECESSARY) AND CHECK MOTOR
60 VISUAL CHECK OVERHEAD
70 VISUAL CHECK FLOOR LEVEL
90 CHECK ALL CONTROL & POWER CIRCUITS
100 CHECK COOLING ANS & WIRES
110 CHECK FOR LOOSE PARTS
120 RECORD RUNNING TIME

End of Asset G4-3NAC1000

G4-3NAC2000 #2 NAV LOCK COMPRESSOR

No PMs for G4-3NAC2000

G4-3NAC3000 #3 NAV LOCK COMPRESSOR

No PMs for G4-3NAC3000

G4-3NB00000 BULKHEADS

No PMs for G4-3NB00000

G4-3NBBZ000 STOPLOGS

No PMs for G4-3NBBZ000

G4-3NBEV200 LOCK EMPTYING VALVE BULKHEAD V2

No PMs for G4-3NBEV200

G4-3NBFB000 FLOATING BULKHEADS

8 G4-3NBFBM BULKHEAD: FLOATING - Mechanics G4-3MECH 5 YEARS
Next 8/13/13 Ext 8/1/13 Next Job G4-3NBFBM-A Use Target Start: Y

G4-3NBFBM-A BULKHEAD: FLOATING ANNUAL 1

5 WEAR FLOATATION VEST ON FLOATING BULKHEADS: P.M.
10 SAFE CLEARANCE: NAVAGATION LOCK
20 OPEN AND CLOSE VALVES. LUBE VALVE THREADS
30 OPERATE CENTERING ARMS
40 SEE THAT 3" VENT AND SOUNDING TUBES ARE CAPPED
50 REMOVE HATCH, CHECK INTERIOR AIR TIGHT COMPARTMENT
60 CHECK CONDITION OF DRAFT GAGES & PAINT IF NEEDED
70 CHECK MOORING LINES TO SEE IF SECURED AND IN GOOD

End of Asset G4-3NBFB000

G4-3NBFUP00 FLOATING BULKHEADS UNWATERING PUMPS

9 G4-3NBFBPE PUMPS:(4) FLOATING BULKHEAD SOUTH SHORE - Electricians G4-3ELECT 1 YEARS
Next 2/1/13 Next Job G4-3NBFBPE- Use Target Start: Y

G4-3NBFBPE-A PUMPS: 1- 1/2 HP FLOATING BULKHEADS Annual 1

5 NOTE: WEAR FLOTATION VEST ON BULKHEAD. 2 PEOPLE
10 SAFE CLEARANCE: SOUTH SHORE
20 GIVE A RUNNING INSPECTION
30 CHECK MOTOR STARTERS
40 CHECK MOTOR RUNNING CURRENT
50 CHECK POWER CORD
60 MEGGER MOTOR _____M OHM

End of Asset G4-3NBFUP00

G4-3NBFUP10 FLOATING BULKHEADS UNWATERING PUMP #1

No PMs for G4-3NBFUP10

G4-3NBFUP1C MOTOR CONTROLLER

No PMs for G4-3NBFUP1C

G4-3NBFUP20 FLOATING BULKHEADS UNWATERING PUMP #2

No PMs for G4-3NBFUP20

G4-3NBFUP2C MOTOR CONTROLLER

No PMs for G4-3NBFUP2C

G4-3NBFUP30 FLOATING BULKHEADS UNWATERING PUMP #3

No PMs for G4-3NBFUP30

G4-3NBFUP3C MOTOR CONTROLLER

No PMs for G4-3NBFUP3C

G4-3NBFUP40 FLOATING BULKHEADS UNWATERING PUMP #4

No PMs for G4-3NBFUP40

G4-3NBFUP4C MOTOR CONTROLLER

No PMs for G4-3NBFUP4C

G4-3NBFV300 LOCK FILL VALVE BULKHEAD V3

No PMs for G4-3NBFV300

G4-3NBFV400 LOCK FILL VALVE BULKHEAD V4

No PMs for G4-3NBFV400

G4-3NBUWSSG UNWATERING SUMP SLUCE GATE

No PMs for G4-3NBUWSSG

G4-3NBVB000 FILL/EMPTYING VALVE BULKHEADS

10 G4-3NBBZM BULKHEAD:(6) TAINTER VALVES - Mechanics G4-3MECH 1 YEARS
Next 3/1/13 Next Job G4-3NBBZM-A Use Target Start: Y

G4-3NBBZM-A BULKHEADS: TAINTER VALVE - ANNUAL 1

5 SAFE CLEARANCE: TAINTER VALVES (6)
20 CHECK SEALS
30 CHECK WELDS ON LIFTING EYES
40 PERFORM OVERALL INSPECTION
50 Route completed PM through Chief of Maintenance for hydroamp update

End of Asset G4-3NBVB000

G4-3NBVE000 LOCK EMPTYING VALVE BULKHEAD

No PMs for G4-3NBVE000

G4-3NBVE100 LOCK EMPTYING VALVE BULKHEAD V1

No PMs for G4-3NBVE100

G4-3NBVF000 LOCK FILL VALVE BULKHEAD

No PMs for G4-3NBVF000

G4-3NECC100 CONTROL CONSEL

No PMs for G4-3NECC100

G4-3NECC200 CONTROL CONSEL

No PMs for G4-3NECC200

G4-3NECS000 CONTROL STANDS

11 G4-3NECS2E STAND: LOCK CONTROL #S2 Electricians G4-3ELECT 1 YEARS
Next 2/1/13 Next Job G4-3NECS2E- Use Target Start: Y

G4-3NECS2E-A STAND: LOCK CONTROL # S2 Semi Annual 1

10 SAFE CLEARANCE: NAVIGATION LOCK DECK
20 CHECK STOP & GO LIGHTS, CHANGE BULBS
40 CHECK FOR LOOSE WIRE TERMINAL CONNECTIONS
50 CHECK BUBBLER CONTROL SYSTEM

End of Asset G4-3NECS000

G4-3NECS0DS DOWN STREAM CONTROL STAND

No PMs for G4-3NECS0DS

G4-3NECS0US UP STREAM CONTROL STAND

12 G4-3NECS1E STAND: LOCK CONTROL #S1 Electricians G4-3ELECT 1 YEARS
Next 4/1/13 Next Job G4-3NECS1E Use Target Start: Y

G4-3NECS1E	STAND: LOCK CONTROL # S1 Annual	1
10	SAFE CLEARANCE: NAVIGATION LOCK DECK	
20	CHECK STOP & GO LIGHTS, CHANGE BULBS	
30	CHECK HORN SIGNAL CONTROLS	
40	CHECK FOR LOOSE WIRE TERMINAL CONNECTIONS	
50	CHECK BUBBLER CONTROL SYSTEM	
70	CHECK NO SMOKING LIGHTS	

13 G4-3NECS1M STAND: LOCK CONTROL #S1 - Mechanics G4-3MECH 6 MONTHS
Next 8/1/12 Next Job G4-3NECS1M- Use Target Start: Y

G4-3NECS1M-A	LOCK CONTROL STAND: # S1-	2
10	SAFE CLEARANCE: NAVIGATION LOCK DECK	
20	CHECK BUBBLER CONTROL SYSTEM	
30	PERFORM WINDOW & DOOR MAINTENANCE	
G4-3NECS1M-S	LOCK CONTROL STAND: # S1- SEMI-ANNUAL	1
10	SAFE CLEARANCE: NAVIGATION LOCK DECK	
20	CHECK BUBBLER CONTROL SYSTEM	
30	PERFORM WINDOW & DOOR MAINTENANCE	

14 G4-3NECS2M STAND: LOCK CONTROL #S2 - Mechanics G4-3MECH 6 MONTHS
Next 8/1/12 Next Job G4-3NECS2M- Use Target Start: Y

G4-3NECS2M-A	LOCK CONTROL STAND: # S2 - ANNUALY	2
10	SAFE CLEARANCE: NAVIGATION LOCK DECK	
20	CHECK BUBBLER CONTROL SYSTEM	
30	PERFORM WINDOW & DOOR MAINTENANCE	
G4-3NECS2M-S	LOCK CONTROL STAND: # S2 - SEMI-ANNUAL	1
10	SAFE CLEARANCE: NAVIGATION LOCK DECK	
20	CHECK BUBBLER CONTROL SYSTEM	
30	PERFORM WINDOW & DOOR MAINTENANCE	

End of Asset G4-3NECS0US

G4-3NEHVAC1 HVAC

No PMs for G4-3NEHVAC1

G4-3NEHVAC2 HVAC

No PMs for G4-3NEHVAC2

G4-3NEIC000 INTERCOM

No PMs for G4-3NEIC000

G4-3NFSP1C MOTOR CONTROLLER

No PMs for G4-3NFSP1C

G4-3NFSP2C MOTOR CONTROLLER

No PMs for G4-3NFSP2C

G4-3NFSWCDS WATER CONON D/S

No PMs for G4-3NFSWCDS

G4-3NFSWCUS WATER CONON U/S

No PMs for G4-3NFSWCUS

G4-3NGATE00 GATES

No PMs for G4-3NGATE00

G4-3NGDN000 DOWNSTREAM GATE #1

15 G4-3NGDN1E GATE: VERTICAL LIFT #1 - Electricians G4-3ELECT 1 YEARS
Next 3/1/13 Next Job G4-3NGDN1E- Use Target Start: Y

G4-3NGDN1E-A	GATE: VERTICAL LIFT #1 Annual	1

10 SAFE CLEARANCE OR SWITCHING PERMIT NAVIGATION LOCK (DOWNSTREAM
20 CHECK DIFFERENTIAL PRESSURE CONTROL ADJUSTMENT
30 CHECK & TIGHTEN LIMIT SWITCH & SELSYN DRIVE
40 CHECK CONTROL PANEL EQUIPMENT
50 GATE HYDRAULIC DRIVE MOTOR
60 CHECK ADJUSTMENT OF TEMPERATURE SWITCHES
70 CHECK TOWER MONORAIL HOIST MOTOR AND CONTROLS
71 CHECK TOWER HEATERS AND FAN MOTORS
80 INSPECT GATE LIMIT SWITCHES
90 CONTROL STAND:
100 CHECK THRUSTER BRAKE OIL LEVEL

16 G4-3NGDN1EL GATE: VERTICAL LIFT #1 - Eltech G4-3ELTECH 3 MONTHS
Next 9/29/12 Next Job G4-3NGDN1El Use Target Start: Y
G4-3NGDN1EL-Q GATE: VERTICAL LIFT #1 Quarterly 1
10 SAFE CLEARANCE:NAVIGATION LOCK
20 CHECK ELECTRONIC CONTROLS

17 G4-3NGDN1M GATE: VERTICAL LIFT #1 (DOWNSTREAM) -Mechanics G4-3MECH 1 YEARS
Next 2/1/13 Next Job G4-3NGDN1M Use Target Start: Y
G4-3NGDN1M-A GATE: VERTICAL LIFT # 1 (A) 1
10 SAFE CLEARANCE: NAVIGATION LOCK
20 LUBRICATE SHAFT COUPLINGS, CHECK FOR EVIDENCE OF
30 INSPECT BRAKE, LUBE PIVOT POINTS, DRAIN THRUSTOR
40 REPLACE HYDRAULIC FILTERS
50 CHECK RELIEF VALVE SETTINGS (2500 PSI)
60 REPAIR OIL LEAKS, PIPE CONNECTIONS & SEALS
70 SERVICE TOWER MONORAILS & GATE WHEEL HOISTS
80 CHECK OIL LEVEL IN GEAR REDUCERS (EP 140)
90 INSPECT & DRESS CABLE AT DRUM ENDS IN BOTH TOWERS-
100 DOPE CABLE DRUM OPEN GEARS IN BOTH TOWERS-
110 APPLY MT-55 ACCULUBE TO GATE SHOE WITH PAINT
120 CHECK GATE INDICATOR MACHINERY (MARFAK #2); LUBE
130 CHECK COUPLINGS FOR ALIGNMENT & LUBE
140 CHECK GEAR BOXES (DORRIS) FOR LUBE LEVEL ,CLEAN-
150 CHECK WINSMITH GEAR BOX; LUBE WITH EP-90
160 GREASE GUIDE WHEELS
170 INSPECT CABLES & GREASE SHEAVES
180 CHECK MOUNTING BOLTS & TIGHTEN AS NEEDED
190 CLEAN UP AREA; USE CLEAN PAPER ON DECKS AS NEEDED
200 REMOVE LOWER WHEELS ON GATE
210 STRUCTURAL:
220 MECHANICAL:
230 HYDRAULIC HOISTING UNIT #1 & #2
240 MAIN HOIST GEAR BEARINGS

18 G4-3NGDNSHM GATE: VERTICAL LIFT #1 SEAL HEATER - Mechanics G4-3MECH 1 YEARS
Next 11/1/12 Next Job G4-3NGDNSH Use Target Start: Y
G4-3NGDNSH-A VERTICAL LIFT GATE #1 SEAL HEATER- ANNUAL 1
10 SAFE CLEARANCE: NAVIGATION LOCK
20 DURING UNWATERING PERIOD TAP DIRT LEGS
30 CHECK VALVES FOR LEAKAGE
40 CHECK THERMAL OIL LEVEL
50 CHECK FLEX PIPE CONNECTIONS FOR LEAKS OR

End of Asset G4-3NGDN000

G4-3NGDN0BS BEARINGS

No PMs for G4-3NGDN0BS

G4-3NGDN0CD CABLE DRUM

No PMs for G4-3NGDN0CD

G4-3NGDN0ES ELECTRICAL SYSTEM

No PMs for G4-3NGDN0ES

G4-3NGDN0GR GEAR REDUCERS

No PMs for G4-3NGDN0GR

G4-3NGDN0GS GATE STRUCTURE

No PMs for G4-3NGDN0GS

G4-3NGDN0HC CABLES

No PMs for G4-3NGDN0HC

G4-3NGDN0HE HOISTING EQUIPMENT DOWNSTREAM GATE 1

No PMs for G4-3NGDN0HE

G4-3NGDN0HS HYDRAULIC SYSTEM

No PMs for G4-3NGDN0HS

G4-3NGDN0LG LIFT GATE CONTROLS

No PMs for G4-3NGDN0LG

G4-3NGDN0MC MOTOR CONTROL CENTER

No PMs for G4-3NGDN0MC

G4-3NGUP000 UPSTREAM GATE #2

19 G4-3NGUP2E GATE: VERTICAL LIFT #2 G4-3ELECT 1 YEARS
Next 2/2/13 Next Job G4-3NGUP2E- Use Target Start: Y

G4-3NGUP2E-A GATE: VERTICAL LIFT #2 Annual 1

10	SAFE CLEARANCE OR SWITCHER: NAVAGATION LOCK
30	CHECK & TIGHTEN LIMIT SWITCH & SELSYN DRIVE
40	CHECK CONTROL PANEL EQUIPMENT
50	GATE HYDRAULIC DRIVE MOTOR
80	INSPECT GATE LIMIT SWITCHES
90	CONTROL STAND:
100	CHECK THRUSTER BRAKE OIL LEVEL
110	LUBRICATE PUMP DRIVE MOTOR BEARINGS

20 G4-3NGUP2M GATE: VERTICAL LIFT# 2 (UPSTREAM) -Mechanics G4-3MECH 1 YEARS
Next 2/2/13 Next Job G4-3NGUP2M Use Target Start: Y

G4-3NGUP2M-A GATE: VERTICAL LIFT # 2 (UPSTREAM) - ANNUAL 1

10	SAFE CLEARANCE:NAVIGATION LOCK
20	LUBRICATE SHAFT COUPLINGS, CHECK FOR EVIDENCE OF
30	INSPECT BRAKE, LUBE PIVOT POINTS, DRAIN THRUSTOR
40	REPLACE HYDRAULIC FILTERS
50	CHECK RELIEF VALVE SETTINGS (2500 PSI)
60	REPAIR OIL LEAKS, PIPE CONNECTIONS & SEALS
80	CHECK OIL LEVEL IN GEAR REDUCERS (EP 140)
90	INSPECT & DRESS CABLE AT DRUM ENDS IN BOTH TOWERS-
100	DOPE CABLE DRUM OPEN GEARS IN BOTH TOWERS-
120	CHECK GATE INDICATOR MACHINERY (MARFAK #2); LUBE
130	CHECK COUPLINGS FOR ALIGNMENT & LUBE
140	CHECK GEAR BOXES (DORRIS) FOR LUBE LEVEL ,CLEAN-
150	CHECK WINSMITH GEAR BOX; LUBE WITH EP-90
170	INSPECT CABLES & GREASE SHEAVES
180	CHECK MOUNTING BOLTS & TIGHTEN AS NEEDED
190	CLEAN UP AREA; USE CLEAN PAPER ON DECKS AS NEEDED
200	HYDRAULIC HOISTING UNIT #3 & #4
210	STRUCTURAL:
220	MECHANICAL:

21 G4-3NGUPSHM GATE: VERTICAL LIFT #2 SEAL HEATER -Mechanics G4-3MECH 1 YEARS
Next 11/1/12 Next Job G4-3NGUPSH Use Target Start: Y

G4-3NGUPSHM-A VERTICAL LIFT GATE # 2 SEAL HEATER- ANNUAL 1

10	SAFE CLEARANCE: NAVIGATION LOCK
20	CHECK VALVES FOR LEAKAGE
30	CHECK THERMAL OIL LEVEL
40	CHECK PUMP DRIVE, PACKING & COUPLING AND LUBE PACKING
50	CLEAN & CHECK STRAINER
60	TAP DIRT LEGS LOCATED IN UP STREAM CROSS OVER
70	CHECK FLEX CONNECTORS FOR LEAKS OR DETERIORATION

End of Asset G4-3NGUP000

G4-3NGUP0BS BEARINGS

No PMs for G4-3NGUP0BS

G4-3NGUP0CD CABLE DRUM

No PMs for G4-3NGUP0CD

G4-3NGUP0ES ELECTRICAL SYSTEM

No PMs for G4-3NGUP0ES

G4-3NGUP0GR GEAR REDUCER

No PMs for G4-3NGUP0GR

G4-3NGUP0GS GATE STRUCTURE

No PMs for G4-3NGUP0GS

G4-3NGUP0HC CABLES

No PMs for G4-3NGUP0HC

G4-3NGUP0HE HOISTING EQUIPMENT UPSTREAM GATE 2

No PMs for G4-3NGUP0HE

G4-3NGUP0HS HYDRAULIC SYSTEM

No PMs for G4-3NGUP0HS

G4-3NI00000 INFRASTRUCTURE

No PMs for G4-3NI00000

G4-3NIBU000 BUILDINGS

22 G4-3NIBUE BUILDING: NAVLOCK Electricians G4-3ELECT 1 YEARS
Next 10/4/12 Next Job G4-3NIBUE-A Use Target Start: Y

G4-3NIBUE-A BUILDING: NAVLOCK Annual 1

20 VENTILATION
30 HEATING
40 PLUMBING

23 G4-3NIBUM BUILDING: NAVLOCK - Mechanics G4-3MECH 6 MONTHS
Next 10/4/12 Next Job G4-3NIBUM-S Use Target Start: Y

G4-3NIBUM-S BUILDING: NAVLOCK SEMI-ANNUAL 1

10 SAFE CLEARANCE: NAVIGATION LOCK SERVICE GALLERY
20 CHECK PIPING AND VALVING FOR LEAKS
30 CHECK PIPE HANGERS AND PIPE SUPPORTS

End of Asset G4-3NIBU000

G4-3NIDF000 DIFFUSERS

No PMs for G4-3NIDF000

G4-3NIFGW00 FLOATING GUIDEWALL

24 G4-3NIGWE GUIDEWALL: FLOATING NAVIGATION LOCK - UPSTREAM - Electricians G4-3ELECT 6 MONTHS
Next 9/1/12 Next Job G4-3NIGWE-S Use Target Start: Y

G4-3NIGWE-S GUIDEWALL: (FLOATING) Semi Annual 1

10 SAFE CLEARANCE: NAVIGATION LOCK (LIFE JACKETS)
20 CHECK 3 EACH REELITES
30 CHECK GROUND CABLE AND CONNECTION
40 CHECK POLE, STRAP AND WIND GAUGE TRANSMITTER
50 CHECK THE CONDITION OF RECEPTACLES
60 CHECK CONDITION OF LIGHT STANDARDS
70 CHECK CONDITION OF CABLE CONNECTIONS

25 G4-3NIGWM GUIDEWALL: FLOATING NAVIGATION LOCK - UPSTREAM - Mechanics G4-3MECH 6 MONTHS
Next 7/1/12 Next Job G4-3NIGWM-S Use Target Start: Y

G4-3NIGWM-S GUIDEWALL: (FLOATING) SEMI-ANNUAL 1

10 SAFE CLEARANCE: NAVIGATION LOCK (LIFE JACKETS)
20 CHECK AIRLINE FOR LEAKS (FLEXIBLE HOSE COUPLINGS)
30 CHECK OPERATION OF BUBBLE PIPES & AIR
40 CHECK CONDITION OF HANDRAILS, GATE & LADDER
50 INSPECT ANCHOR LINKAGE
60 CHECK THE CONDITION OF THE KEY LOCK ROLLER
70 CHECK WATER LEVELS IN EACH COMPARTMENT, AND PUMP
80 CHECK HANDWINCH
90 LUBE SHEAVES

End of Asset G4-3NIFGW00

G4-3NIGW000 GUIDEWALLS

No PMs for G4-3NIGW000

G4-3NILC000 LOCK CHAMBER

No PMs for G4-3NILC000

G4-3NILS000 LOCK STRUCTURE

26 G4-3NIBCMA BARGE CLEATS- Mechanics G4-3MECH 1 YEARS
Next 5/1/13 Next Job G4-3NIBCAM Use Target Start: Y
G4-3NIBCAM BARGE CLEATS Annual 1
10 INSPECT COMMERCIAL BARGE CLEATS FOR

End of Asset G4-3NILS000

G4-3NILT000 NAVLOCK LIGHTING

No PMs for G4-3NILT000

G4-3NIMB000 MOORING BITS

27 G4-3NIMBM BIT: MOORING, FLOATING #1 - #8 - Mechanics G4-3MECH 1 YEARS
Next 7/1/12 Next Job G4-3NIMBM-A Use Target Start: Y
G4-3NIMBM-A BIT: MOORING, FLOATING #1 - #8 ANNUAL 1
10 SAFE CLEARANCE: NAVIGATION LOCK
20 BIT: #1
30 BIT: #2
40 BIT: #3
50 BIT: #4
60 BIT: #5
70 BIT: #6
80 BIT: #7
90 BIT: #8

End of Asset G4-3NIMB000

G4-3NIRO000 ROADWAYS

No PMs for G4-3NIRO000

G4-3NIWS000 WEATHER STATION

No PMs for G4-3NIWS000

G4-3NM00000 MISCELLANEOUS

28 G4-3NMHOISM HOIST: NAVLOCK - Mechanics G4-3MECH 1 YEARS
Next 5/1/13 Next Job G4-3NMHOISM Use Target Start: Y
G4-3NMHOISM-A HOIST: NAVLOCK (A) 1
5 SAFE CLEARANCE: NAVIGATION LOCK
10 INSPECT HOIST: #'S 22226 & 22227
20 LUBRICATE HOIST AS NECESSARY
30 TEST CABLE AT 5000 LBS CAPACITY
40 LUBRICATE TROLLY
50 CHECK HOOK B 30.9
60 TEST TWO BLOCK

End of Asset G4-3NM00000

G4-3NPLQ300 LQ-3 480 Volt Distribution Panel

No PMs for G4-3NPLQ300

G4-3NPLR300 LR-3 SWITCHGEAR

No PMs for G4-3NPLR300

G4-3NPLR500 LR-5 SWITCHGEAR

No PMs for G4-3NPLR500

G4-3NPLRS20 LRS-2 SWITCHGEAR

No PMs for G4-3NPLRS20

G4-3NS00000 STATION SERVICE

29 G4-3NSLQE MOTOR CONTROL CENTERS: PANELBOARD & SUBSTATIONS - Electricians G4-3ELECT 4 YEARS

Next 11/1/13 Ext 11/1/13 Next Job G4-3AFFPWG Use Target Start: Y

G4-3AFFPWGE-Q FISHWAY ATTR. PUMP 1, 2, & 3 (Q) 1

10 SAFE CLEARANCE ELEVATION 407
40 VISUALLY CHECK FISHWAY BUTTERFLY FLOW VALVE
50 INSPECT OPERATION WHEN SHUTTING DOWN PUMP " ONLY"
60 CHECK ALL CONTROL SWITCHES

End of Asset G4-3NS00000

G4-3NSLCQ10 LCQ-1 480 Volt Control Center

No PMs for G4-3NSLCQ10

G4-3NSLCQ20 LCQ-2 480 Volt Control Center

No PMs for G4-3NSLCQ20

G4-3NSLCQ30 LCQ-3 480 Volt Control Center

No PMs for G4-3NSLCQ30

G4-3NSLCQ40 LCQ-4 480 Volt Control Center

No PMs for G4-3NSLCQ40

G4-3NSLP000 4160 LOAD CENTER

No PMs for G4-3NSLP000

G4-3NSLQ000 480 LOAD CENTER

No PMs for G4-3NSLQ000

G4-3NSLQ100 LQ-1 480 Volt Distribution Panel

No PMs for G4-3NSLQ100

G4-3NSLQ400 LQ-4 480 Volt Distribution Panel

No PMs for G4-3NSLQ400

G4-3NSLQ500 LQ-5 480 Volt Distribution Panel

No PMs for G4-3NSLQ500

G4-3NSLR000 120 VOLT LOAD CENTER

No PMs for G4-3NSLR000

G4-3NSLR100 LR-1 SWITCHGEAR

No PMs for G4-3NSLR100

G4-3NSLR200 LR-2 SWITCHGEAR

No PMs for G4-3NSLR200

G4-3NSLR400 LR-4 SWITCHGEAR

No PMs for G4-3NSLR400

G4-3NSLRS10 LRS-1 SWITCHGEAR

No PMs for G4-3NSLRS10

G4-3NSLSP100 LSP1 4160 VOLT SWITCHGEAR

No PMs for G4-3NSLSP100

G4-3NSLSP200 LSP2 4160 VOLT SWITCHGEAR

No PMs for G4-3NSLSP200

G4-3NSLSQ10 LSQ-1 480-volt switchgear

No PMs for G4-3NSLSQ10

G4-3NSLSQ20 LSQ-2 480 Volt Switchgear

No PMs for G4-3NSLSQ20

G4-3NV00000 TAINTER VALVES

No PMs for G4-3NV00000

G4-3NVDV100 DRAIN VALVE #1

30 G4-3NVDZ1E VALVE: TAINTER #1 (EMPTYING VALVE) Electricians G4-3ELECT 1 YEARS

Next 2/2/13 Next Job G4-3NVDZ1E- Use Target Start: Y

G4-3NVDZ1E-A VALVE: TAINTER #1 Annual 1

10 SAFE CLEARANCE OR SWITCHER: NAVIGATION LOCK
20 CHECK AND ADJUST LIMIT SWITCHES AND SELSYNS
30 CHECK AND ADJUST PERMISSIVE SWITCHES.
40 CHECK OIL HEATERS AND EQUIPMENT HEATERS
50 CHECK GATE AND VALVE INTERLOCKS
60 CHECK INTERLOCK BY-PASSES
70 CHECK INDICATING LIGHTS AND SELSYN RECEIVERS
80 CHECK FLOAT SWITCH
90 LUBE PUMP MOTOR BEARINGS
100 MEGGAR MOTOR

31 G4-3NVDZ1M-A VALVE, TAINTER #1 (EMPTYING VALVE) - Mechanics G4-3MECH 1 YEARS
Next 3/1/13 Next Job G4-3NVDZ1M- Use Target Start: Y

G4-3NVDZ1M-A TAINTER VALVES 1-2 1

10 RECORD TIME FOR ADMINISTRAVITVE FUNCTIONS (AHA, HECP, CLEARANCE
12 INSTALL BULKHEADS AND OPEN SLUCE GATE
14 UNWATER
19 REPLACE BROKEN OR DAMAGED LUBE LINES
20 INSPECT LUBRICATION: FARVAL LUBE SYSTEM
30 VALVE TRUNNION (2EA) METERED QUANITY, USE
40 LOWER ROD PIN : METERED QUANITY,USE
50 CROSSHEAD PIN : METERED QUANITY, USE
60 CROSSHEADS GUIDES (2EA) METERED QUANITY, USE
70 PUSH ROD GUIDE: AS NEEDED QUANITY, USE
80 INDICATOR SYSTEM: (USE BUTTON HEAD FITTINGS) USE
90 ROLLER CHAIN , IDLER SHAFT UPPER & IDLER SHAFT -
100 REDUCER: USE EP150 ; CHECK OIL LEVEL
110 REDUCER : DRIVE SHAFT PILLOW BLOCKS & SPROCKETS
111 LUBRICATE SHAFT COUPLING AND CHECK ALIGNMENT
120 HYDRAULIC PUMP SYSTEM: USE TEXACO REGAL OIL -
121 CHECK HYDRAULIC FLUID LEVEL (R&O 32)
131 REPAIR OIL LEAKS.
221 DURING UNWATERING PERIOD
222 LUBE INDICATOR ASSEMBLY GUIDES AND CHAIN
223 TIGHTEN MACHINERY MOUNTING BOLTS
240 CLEAN CYLINDER PIT AND DRAIN
241 TIGHTEN CYLINDER MOUNTING BOLTS
242 VENT AIR FROM HYDRAULIC CYLINDERS
250 CLEAN UP MACHINERY ROOM
260 REPLACE FILTER CARTRIDGES
270 CHECK FLEXIBLE HOSES FOR DAMAGE
275 CHECK VALVES FOR CRACKED WELDS AT POINT OF
280 CHECK FOR VALVE DRIFT. ADJUST AS NECESSARY
290 CHECK ADJUSTMENT OF RELIEF VALVES
300 CHECK VALVE OPENING & CLOSING SPEED;
310 TAKE OIL SAMPLES
320 TAP TRUNNION MOUNTING BOLTS TO CHECK FOR BROKEN OR
330 CHECK SEALS FOR DAMAGE & REPLACE IF NEEDED
340 CHECK SEAL KEEPER BOLTS FOR LOOSE OR BROKEN BOLTS.
350 CHECK OPERATING ROD GUIDE MOUNTING BOLTS & BEARING
360 CHECK & TIGHTEN INDICATOR ROD ATTACHMENTS
370 CHECK OPERATOR ROD & INDICATOR ROD PACKING
380 INSPECT LINER & TRANSITION PLATES FOR CAVITATION
390 CHECK CULVERTS & LATERIALS FOR CAVITATION & DEBRIS
400 INSTALL UPSTREAM & DOWNSTREAM BULKHEADS
410 INSPECT INDICATOR ROD BRACKET, INDICATOR ROD PIN,
420 CLOSE SLUCE GATE AND WATER UP
430 REMOVE BULK HEADS

End of Asset G4-3NVDV100

G4-3NVDV1HC HYDRAULIC CYL

No PMs for G4-3NVDV1HC

G4-3NVDV1TV TAINTER VALVE #1

No PMs for G4-3NVDV1TV

G4-3NVDV200 DRAIN VALVE #2

32 G4-3NVDZ2E VALVE: TAINTER #2 (EMPTYING VALVE) Electricians G4-3ELECT 1 YEARS

Next 2/2/13 Next Job G4-3NVDZ2E- Use Target Start: Y

G4-3NVDZ2E-A VALVE: TAINTER #2 (EMPTY. VALVE) Annual 1

10 SAFE CLEARANCE: NAVIGATION LOCK
20 CHECK AND ADJUST LIMIT SWITCHES AND SELSYNS
30 CHECK AND ADJUST PERMISSIVE SWITCHES.
40 CHECK OIL HEATERS AND EQUIPMENT HEATERS
50 CHECK GATE AND VALVE INTERLOCKS
60 CHECK INTERLOCK BY-PASSES
70 CHECK INDICATING LIGHTS AND SELSYN RECEIVERS
80 CHECK FLOAT SWITCH
90 LUBE PUMP MOTOR BEARINGS
100 MEGGAR MOTOR

33 G4-3NVDZ2M-A VALVE, TAINTER #2 (EMPTYING VALVE) - Mechanics G4-3MECH 1 YEARS

Next 3/1/13 Next Job G4-3NVDZ1M- Use Target Start: Y

G4-3NVDZ1M-A TAINTER VALVES 1-2 1

10 RECORD TIME FOR ADMINISTRAVITVE FUNCTIONS (AHA, HECP, CLEARANCE
12 INSTALL BULKHEADS AND OPEN SLUCE GATE
14 UNWATER
19 REPLACE BROKEN OR DAMAGED LUBE LINES
20 INSPECT LUBRICATION: FARVAL LUBE SYSTEM
30 VALVE TRUNNION (2EA) METERED QUANITY, USE
40 LOWER ROD PIN : METERED QUANITY,USE
50 CROSSHEAD PIN : METERED QUANITY, USE
60 CROSSHEADS GUIDES (2EA) METERED QUANITY, USE
70 PUSH ROD GUIDE: AS NEEDED QUANITY, USE
80 INDICATOR SYSTEM: (USE BUTTON HEAD FITTINGS) USE
90 ROLLER CHAIN , IDLER SHAFT UPPER & IDLER SHAFT -
100 REDUCER: USE EP150 ; CHECK OIL LEVEL
110 REDUCER : DRIVE SHAFT PILLOW BLOCKS & SPROCKETS
111 LUBRICATE SHAFT COUPLING AND CHECK ALIGNMENT
120 HYDRAULIC PUMP SYSTEM: USE TEXACO REGAL OIL -
121 CHECK HYDRAULIC FLUID LEVEL (R&O 32)
131 REPAIR OIL LEAKS.
221 DURING UNWATERING PERIOD
222 LUBE INDICATOR ASSEMBLY GUIDES AND CHAIN
223 TIGHTEN MACHINERY MOUNTING BOLTS
240 CLEAN CYLINDER PIT AND DRAIN
241 TIGHTEN CYLINDER MOUNTING BOLTS
242 VENT AIR FROM HYDRAULIC CYLINDERS
250 CLEAN UP MACHINERY ROOM
260 REPLACE FILTER CARTRIDGES
270 CHECK FLEXIBLE HOSES FOR DAMAGE
275 CHECK VALVES FOR CRACKED WELDS AT POINT OF
280 CHECK FOR VALVE DRIFT. ADJUST AS NECESSARY
290 CHECK ADJUSTMENT OF RELIEF VALVES
300 CHECK VALVE OPENING & CLOSING SPEED;
310 TAKE OIL SAMPLES
320 TAP TRUNNION MOUNTING BOLTS TO CHECK FOR BROKEN OR
330 CHECK SEALS FOR DAMAGE & REPLACE IF NEEDED
340 CHECK SEAL KEEPER BOLTS FOR LOOSE OR BROKEN BOLTS.
350 CHECK OPERATING ROD GUIDE MOUNTING BOLTS & BEARING
360 CHECK & TIGHTEN INDICATOR ROD ATTACHMENTS
370 CHECK OPERATOR ROD & INDICATOR ROD PACKING
380 INSPECT LINER & TRANSITION PLATES FOR CAVITATION
390 CHECK CULVERTS & LATERIALS FOR CAVITATION & DEBRIS
400 INSTALL UPSTREAM & DOWNSTREAM BULKHEADS
410 INSPECT INDICATOR ROD BRACKET, INDICATOR ROD PIN,
420 CLOSE SLUCE GATE AND WATER UP
430 REMOVE BULK HEADS

End of Asset G4-3NVDV200

G4-3NVDV2HC HYDRUALIC CYL

No PMs for G4-3NVDV2HC

G4-3NVDV2HU HYDRUALIC UNIT

No PMs for G4-3NVDV2HU

G4-3NVDV2TV TAINTER VALVE #2

No PMs for G4-3NVDV2TV

G4-3NVDVC00 DRAIN VALVE CONTROLS

No PMs for G4-3NVDVC00

G4-3NVDVLS1 AUTO LUBE SYS

No PMs for G4-3NVDVLS1

G4-3NVDVLS2 AUTO LUBE SYS

No PMs for G4-3NVDVLS2

G4-3NVDZ000 DRAIN VALVES

No PMs for G4-3NVDZ000

G4-3NVDZ0HD HYDRAULIC UNIT

No PMs for G4-3NVDZ0HD

G4-3NVFV300 FILL VALVLE #3

34 G4-3NVFZ3E VALVE: TAINTER #3 (FILLING VALVE) Electricians G4-3ELECT 1 YEARS
Next 2/2/13 Next Job G4-3NVFZ3E-/ Use Target Start: Y

G4-3NVFZ3E-A VALVE: TAINTER #3 FILL VALVE Annual 1

10 SAFE CLEARANCE:NAVIGATION LOCK
20 INDICATING ROD ASSEMBLY
30 PERMISSIVE SWITCHES
40 CHECK OIL HEATERS AND EQUIPMENT HEATERS
50 CHECK GATE AND VALVE INTERLOCKS
60 CHECK INTERLOCK BY-PASSES
70 CONTROL STANDS:
80 CHECK FLOAT SWITCH.
90 LUBE PUMP MOTOR BEARINGS

35 G4-3NVFZ3M VALVE: TAINTER #3 (FILLING VALVE) Mechanics G4-3MECH 1 YEARS
Next 3/1/13 Next Job G4-3NVFZ3M- Use Target Start: Y

G4-3NVFZ3M-2 TAINTER # 3 (A) 1

10 SAFE CLEARANCE:NAVAGATION LOCK
20 LUBRICATION: FARVAL LUBE SYSTEM, FOLLOW INST-
30 VALVE TRUNNION (2EA) METERED QUANITY, USE
40 LOWER ROD PIN : METERED QUANITY,USE
50 CROSSHEAD PIN : METERED QUANITY, USE
60 CROSSHEADS GUIDES : METERED QUANITY, USE
70 PUSH ROD GUIDE: AS NEEDED QUANITY, USE
80 INDICATOR SYSTEM: (USE BUTTON HEAD FITTINGS) USE
90 ROLLER CHAIN , IDLER SHAFT UPPER & IDLER SHAFT -
100 REDUCER: USE MEROPA 3 ; CHECH OIL LEVEL
110 REDUCER : DRIVE SHAFT PILLOW BLOCKS & SPROCKETS
120 HYDRAULIC PUMP SYSTEM: USE TEXACO REGAL OIL -
130 CHECK HYDRAULIC FLUID LEVEL (R&O 32)
140 REPLACE FILTER CARTRIDGES
150 CHECK FLEXIBLE HOSES FOR DAMAGE
160 CHECK FOR VALVE DRIFT. ADJUST AS NECESSARY
170 CLEAN UP MACHINERY ROOM
180 REPLACE BROKEN OR DAMAGED LUBE LINES
190 DURING UNWATERING PERIOD
200 LUBE INDICATOR ASSEMBLY GUIDES AND CHAIN
210 CHECK ADJUSTMENT OF RELIEF VALVES
220 CHECK VALVE OPENING AND CLOSING SPEED
221 CHECK VALVES FOR CRACKED WELDS AT
230 REPAIR OIL LEAKS
231 TAKE OIL SAMPLE
240 TIGHTEN MACHINERY MOUNTING BOLTS
241 TAP TRUNNION MOUNTING BOLTS TO CHECK FOR BROKEN OR
250 LUBRICATE SHAFT COUPLINGS AND CHECK ALIGNMENT
260 CLEAN CYLINDER PIT AND DRAIN
270 TIGHTEN CYLINDER MOUNTING BOLTS
280 VENT AIR FROM HYDRAULIC CYLINDERS
290 CHECK SEALS FOR DAMAGE AND REPLACE IF NEEDED
291 CHECK SEAL KEEPER BOLTS FOR LOOSE OR BROKEN BOLTS
300 CHECK OPERATING ROD GUIDE MOUNTING BOLTS
310 CHECK AND TIGHTEN INDICATOR ROD ATTACHMENT

311 CHECK OPERATING ROD AND INDICATOR ROD PACKING
312 INSPECT INDICATOR ROD BRACKET, INDICATOR ROD PIN,
320 INSPECT LINER AND TRANSITION PLATES FOR CAVITATION
321 INSPECT CULVERTS AND LATERALS FOR CAVITATION
330 INSTALL UPSTREAM AND DOWNSTREAM BULKHEADS

End of Asset G4-3NVFV300

G4-3NVFV3HC HYDRAULIC CYL

No PMs for G4-3NVFV3HC

G4-3NVFV3HU HYDRAULIC UNIT

No PMs for G4-3NVFV3HU

G4-3NVFV3TV TAINTER VALVE #3

No PMs for G4-3NVFV3TV

G4-3NVFV400 FILL VALVE #4

36 G4-3NVFZ4E VALVE: TAINTER #4 (FILLING VALVE) Electricians G4-3ELECT 1 YEARS
Next 2/2/13 Next Job G4-3NVFZ4E-/ Use Target Start: Y

G4-3NVFZ4E-A VALVE: TAINTER #4 FILL VALVE Annual 1

10 SAFE CLEARANCE:NAVIGATION LOCK
20 INDICATING ROD ASSEMBLY
30 PERMISSIVE SWITCHES
40 CHECK OIL HEATERS AND EQUIPMENT HEATERS
50 CHECK GATE AND VALVE INTERLOCKS
60 CHECK INTERLOCK BY-PASSES
70 CONTROL STANDS:
80 CHECK FLOAT SWITCH.
90 LUBE PUMP MOTOR BEARINGS

37 G4-3NVFZ4M VALVE: TAINTER #4 (FILLING VALVE) - Mechanics G4-3MECH 1 YEARS
Next 2/2/13 Next Job G4-3NVFZ4M- Use Target Start: Y

G4-3NVFZ4M-2 TAINTER # 4 (A) 1

10 SAFE CLEARANCE NAVIGATION LOCK
20 LUBRICATION: FARVAL LUBE SYSTEM, FOLLOW INST-
30 VALVE TRUNNION (2EA) METERED QUANITY, USE
40 LOWER ROD PIN : METERED QUANITY,USE
50 CROSSHEAD PIN : METERED QUANITY, USE
60 CROSSHEADS GUIDES : METERED QUANITY, USE
70 PUSH ROD GUIDE: AS NEEDED QUANITY, USE
80 INDICATOR SYSTEM: (USE BUTTON HEAD FITTINGS) USE
90 ROLLER CHAIN , IDLER SHAFT UPPER & IDLER SHAFT -
100 REDUCER: USE CHEVRON GEAR COMPOUND EP ISO 150 ; CHECK OIL LEVEL
110 REDUCER : DRIVE SHAFT PILLOW BLOCKS & SPROCKETS
120 HYDRAULIC PUMP SYSTEM: USE R&O 32
130 CHECK HYDRAULIC FLUID LEVEL (R&O 32)
140 REPLACE FILTER CARTRIDGES
150 CHECK FLEXIBLE HOSES FOR DAMAGE
160 CHECK FOR VALVE DRIFT. ADJUST AS NECESSARY
170 CLEAN UP MACHINERY ROOM
180 REPLACE BROKEN OR DAMAGED LUBE LINES
190 DURING UNWATERING PERIOD
200 LUBE INDICATOR ASSEMBLY GUIDES AND CHAIN
210 CHECK ADJUSTMENT OF RELIEF VALVES
220 CHECK VALVE OPENING AND CLOSING SPEED
221 CHECK VALVES FOR CRACKED WELDS AT
230 REPAIR OIL LEAKS
231 TEST OIL WITH PORTABLE PARTICLE COUNTER
240 TIGHTEN MACHINERY MOUNTING BOLTS
241 TAP TRUNNION MOUNTING BOLTS TO CHECK FOR BROKEN OR
250 LUBRICATE SHAFT COUPLINGS AND CHECK ALIGNMENT
260 CLEAN CYLINDER PIT AND DRAIN
270 TIGHTEN CYLINDER MOUNTING BOLTS
280 VENT AIR FROM HYDRAULIC CYLINDERS
290 CHECK SEALS FOR DAMAGE AND REPLACE IF NEEDED
291 CHECK SEAL KEEPER BOLTS FOR LOOSE OR BROKEN BOLTS
300 CHECK OPERATING ROD GUIDE MOUNTING BOLTS
310 CHECK AND TIGHTEN INDICATOR ROD ATTACHMENT
311 CHECK OPERATING ROD AND INDICATOR ROD PACKING

312 INSPECT INDICATOR ROD BRACKET, INDICATOR ROD PIN,
320 INSPECT LINER AND TRANSITION PLATES FOR CAVITATION
321 INSPECT CULVERTS AND LATERALS FOR CAVITATION
330 INSTALL UPSTREAM AND DOWNSTREAM BULKHEADS

End of Asset G4-3NVFV400

G4-3NVFV4HC HYDRAULIC CYL

No PMs for G4-3NVFV4HC

G4-3NVFV4HU HYDRAULIC UNIT

No PMs for G4-3NVFV4HU

G4-3NVFV4TV TAINTER VALVE #4

No PMs for G4-3NVFV4TV

G4-3NVFVC00 FILL VALVE CONTROLS

No PMs for G4-3NVFVC00

G4-3NVFVLS3 AUTO LUBE SYSTEM

No PMs for G4-3NVFVLS3

G4-3NVFVLS4 AUTO LUBE SYS

No PMs for G4-3NVFVLS4

G4-3NVFZ000 FILL VALVES #3 & 4

No PMs for G4-3NVFZ000

G4-3NW00000 DRAINAGE & UNWATERING SYSTEM

No PMs for G4-3NW00000

G4-3NWP1000 UNWATERING PUMP #1

38 G4-3NWPLUE PUMP 1 LOCK UNWATERING - Electricians G4-3ELECT 6 MONTHS
Next 7/1/12 Next Job G4-3NWPLUE Use Target Start: Y
G4-3NWPLUE-A PUMP 1&2: LOCK UNWATERING Annual 1
10 SAFE CLEARANCE:NAVIGATION LOCK
20 CHECK CONTROLS
30 CLEAN AND CHECK BREAKER
40 CHECK BEARING OIL LEVEL
60 LUBRICATE BREAKER
70 GIVE RUNNING INSPECTION
80 CHECK BY HAND TOUCHING MOTOR FRAME ASSURE MOTOR HEATER IS WO

39 G4-3NWPLUM PUMP 1 LOCK UNWATERING - Mechanics G4-3MECH 6 MONTHS
Next 7/1/12 Next Job G4-3NWPU1M Use Target Start: Y
G4-3NWPU1M-A PUMPS 1-5 : LOCK UNWATERING ANNUAL 2
10 SAFE CLEARANCE:NAVIGATION LOCK
20 GIVE RUNNING INSPECTION, LISTEN FOR NOISE, WATCH
30 FILL PUMP SHAFT LUBRICATOR WITH DTE OIL. CLEAN
40 CHECK COUPLING AND MOUNTING BOLTS
50 CHECK REVERSE RATCHET MECHANISM FOR WEAR
G4-3NWPU1M-S PUMPS 1-5 LOCK UNWATERING SEMI-ANNUAL 1
10 SAFE CLEARANCE: NAVIGATION LOCK
20 GIVE RUNNING INSPECTION, LISTEN FOR NOISE, WATCH
30 FILL PUMP SHAFT LUBRICATOR WITH DTE OIL. CLEAN
40 CHECK COUPLING AND MOUNTING BOLTS
50 CHECK REVERSE RATCHET MECHANISM FOR WEAR

End of Asset G4-3NWP1000

G4-3NWP1MC0 MOTOR CONTROLLER

No PMs for G4-3NWP1MC0

G4-3NWP2000 UNWATERING PUMP #2

40 G4-3NWPLU2M PUMP 2 LOCK UNWATERING - Mechanics G4-3MECH 6 MONTHS
Next 7/1/12 Next Job G4-3NWPU1M Use Target Start: Y
G4-3NWPU1M-A PUMPS 1-5 : LOCK UNWATERING ANNUAL 2
10 SAFE CLEARANCE:NAVIGATION LOCK
20 GIVE RUNNING INSPECTION, LISTEN FOR NOISE, WATCH

30 FILL PUMP SHAFT LUBRICATOR WITH DTE OIL. CLEAN
40 CHECK COUPLING AND MOUNTING BOLTS
50 CHECK REVERSE RATCHET MECHANISM FOR WEAR

G4-3NWPU1M-S PUMPS 1-5 LOCK UNWATERING SEMI-ANNUAL 1

10 SAFE CLEARANCE: NAVIGATION LOCK
20 GIVE RUNNING INSPECTION, LISTEN FOR NOISE, WATCH
30 FILL PUMP SHAFT LUBRICATOR WITH DTE OIL. CLEAN
40 CHECK COUPLING AND MOUNTING BOLTS
50 CHECK REVERSE RATCHET MECHANISM FOR WEAR

41 G4-3NWPLUE2 PUMP 2 LOCK UNWATERING - Electricians G4-3ELECT 6 MONTHS
Next 7/1/12 Next Job G4-3NWPLUE Use Target Start: Y

G4-3NWPLUE-A PUMP 1&2: LOCK UNWATERING Annual 1

10 SAFE CLEARANCE:NAVIGATION LOCK
20 CHECK CONTROLS
30 CLEAN AND CHECK BREAKER
40 CHECK BEARING OIL LEVEL
60 LUBRICATE BREAKER
70 GIVE RUNNING INSPECTION
80 CHECK BY HAND TOUCHING MOTOR FRAME ASSURE MOTOR HEATER IS WO

End of Asset G4-3NWP2000

G4-3NWP2MC0 MOTOR CONTROLLER

No PMs for G4-3NWP2MC0

G4-3NWP3000 UNWATERING PUMP #3

42 G4-3NWPD3E PUMP #3: LOCK UNWATERING - Electricians G4-3ELECT 6 MONTHS
Next 7/1/12 Next Job G4-3NWPU3E Use Target Start: Y

G4-3NWPU3E-A PUMP: #3 DRAINAGE Annual 1

10 SAFE CLEARANCE: NAVIGATION LOCK (RIVER SIDE)
20 CHECK CONTROLS
30 CLEAN AND CHECK BREAKER
70 GIVE RUNNING INSPECTION
80 MEGGAR MOTOR
90 CURRENT READING

43 G4-3NWPD3M PUMP #3: LOCK UNWATERING - Mechanics G4-3MECH 6 MONTHS
Next 10/4/12 Next Job G4-3NWPU3M Use Target Start: Y

G4-3NWPU3M-S PUMP: #3 DRAINAGE SEMI-ANNUAL 1

10 SAFE CLEARANCE: NAVIGATION LOCK (RIVER SIDE)
20 GIVE RUNNING INSPECTION, LISTEN FOR NOISE, WATCH
30 INSPECT GLAND LEAK OFF
40 CHECK COUPLING AND MOUNTING BOLTS
50 FILL PACKING WATER PIPE FOR COOLING THE PACKING
60 CHECK SHAFT PACKING
70 CLEAN, INSPECT, AND REPAIR ANY LEAKS
80 INPECT WATER DISCHARGE

44 G4-3NWPLU3M PUMP 3 LOCK UNWATERING - Mechanics G4-3MECH 6 MONTHS
Next 7/1/12 Next Job G4-3NWPU1M Use Target Start: Y

G4-3NWPU1M-A PUMPS 1-5 : LOCK UNWATERING ANNUAL 2

10 SAFE CLEARANCE:NAVIGATION LOCK
20 GIVE RUNNING INSPECTION, LISTEN FOR NOISE, WATCH
30 FILL PUMP SHAFT LUBRICATOR WITH DTE OIL. CLEAN
40 CHECK COUPLING AND MOUNTING BOLTS
50 CHECK REVERSE RATCHET MECHANISM FOR WEAR

G4-3NWPU1M-S PUMPS 1-5 LOCK UNWATERING SEMI-ANNUAL 1

10 SAFE CLEARANCE: NAVIGATION LOCK
20 GIVE RUNNING INSPECTION, LISTEN FOR NOISE, WATCH
30 FILL PUMP SHAFT LUBRICATOR WITH DTE OIL. CLEAN
40 CHECK COUPLING AND MOUNTING BOLTS
50 CHECK REVERSE RATCHET MECHANISM FOR WEAR

End of Asset G4-3NWP3000

G4-3NWP3MC0 MOTOR CONTROLLER

No PMs for G4-3NWP3MC0

G4-3NWP4000 TAINTER VALVE UW PUMP #4

45 G4-3NWPLU4M PUMP 4 LOCK UNWATERING - Mechanics G4-3MECH 6 MONTHS
Next 7/1/12 Next Job G4-3NWPU1M Use Target Start: Y

G4-3NWPU1M-A	PUMPS 1-5 : LOCK UNWATERING ANNUAL		2
	10	SAFE CLEARANCE:NAVIGATION LOCK	
	20	GIVE RUNNING INSPECTION, LISTEN FOR NOISE, WATCH	
	30	FILL PUMP SHAFT LUBRICATOR WITH DTE OIL. CLEAN	
	40	CHECK COUPLING AND MOUNTING BOLTS	
	50	CHECK REVERSE RATCHET MECHANISM FOR WEAR	
G4-3NWPU1M-S	PUMPS 1-5 LOCK UNWATERING SEMI-ANNUAL		1
	10	SAFE CLEARANCE: NAVIGATION LOCK	
	20	GIVE RUNNING INSPECTION, LISTEN FOR NOISE, WATCH	
	30	FILL PUMP SHAFT LUBRICATOR WITH DTE OIL. CLEAN	
	40	CHECK COUPLING AND MOUNTING BOLTS	
	50	CHECK REVERSE RATCHET MECHANISM FOR WEAR	

46 G4-3NWPUTE PUMP 4 LOCK UNWATERING - Electricians G4-3ELECT 1 YEARS
Next 1/1/13 Next Job G4-3NWPUTE Use Target Start: Y

G4-3NWPUTE-S	PUMP 4 & 5: LOCK UNWATERING Annual		1
	10	OBTAIN SAFE CLEARANCE OR SWITCHER NAVIGATION LOCK	
	20	GIVE RUNNING INSPECTION, LISTEN FOR NOISE, WATCH	
	40	MEGGER THE MOTOR WINDING AND RECORD	
	50	CHECK MOTOR STARTERS	
	60	CHECK MOTOR RUNNING CURRENT. MOTOR PROTECTOR BY OVERLOADS AI	

End of Asset G4-3NWP4000

G4-3NWP4MC0 MOTOR CONTROLLER

No PMs for G4-3NWP4MC0

G4-3NWP5000 TAINTER VALVE UW PUMP #5

47 G4-3NWPLU5M PUMP 5 LOCK UNWATERING - Mechanics G4-3MECH 6 MONTHS
Next 7/1/12 Next Job G4-3NWPU1M Use Target Start: Y

G4-3NWPU1M-A	PUMPS 1-5 : LOCK UNWATERING ANNUAL		2
	10	SAFE CLEARANCE:NAVIGATION LOCK	
	20	GIVE RUNNING INSPECTION, LISTEN FOR NOISE, WATCH	
	30	FILL PUMP SHAFT LUBRICATOR WITH DTE OIL. CLEAN	
	40	CHECK COUPLING AND MOUNTING BOLTS	
	50	CHECK REVERSE RATCHET MECHANISM FOR WEAR	
G4-3NWPU1M-S	PUMPS 1-5 LOCK UNWATERING SEMI-ANNUAL		1
	10	SAFE CLEARANCE: NAVIGATION LOCK	
	20	GIVE RUNNING INSPECTION, LISTEN FOR NOISE, WATCH	
	30	FILL PUMP SHAFT LUBRICATOR WITH DTE OIL. CLEAN	
	40	CHECK COUPLING AND MOUNTING BOLTS	
	50	CHECK REVERSE RATCHET MECHANISM FOR WEAR	

End of Asset G4-3NWP5000

G4-3NWP5MC0 MOTOR CONTROLLER

No PMs for G4-3NWP5MC0

G4-3NWPU000 PUMPS

48 G4-3NWPUTE-5 PUMP 5 LOCK UNWATERING- Electricians G4-3ELECT 1 YEARS
Next 4/1/12 Ext 4/1/13 Next Job G4-3NWPUTE Use Target Start: Y

G4-3NWPUTE-S	PUMP 4 & 5: LOCK UNWATERING Annual		1
	10	OBTAIN SAFE CLEARANCE OR SWITCHER NAVIGATION LOCK	
	20	GIVE RUNNING INSPECTION, LISTEN FOR NOISE, WATCH	
	40	MEGGER THE MOTOR WINDING AND RECORD	
	50	CHECK MOTOR STARTERS	
	60	CHECK MOTOR RUNNING CURRENT. MOTOR PROTECTOR BY OVERLOADS AI	

End of Asset G4-3NWPU000

G4-3NX00000 COMPRESSED AIR SYSTEM

No PMs for G4-3NX00000

G4-3NXAC1MC MOTOR CONTROLLER

No PMs for G4-3NXAC1MC

G4-3NXAC2MC MOTOR CONTROLLER

No PMs for G4-3NXAC2MC

G4-3NXAC3MC MOTOR CONTROLLER

No PMs for G4-3NXAC3MC

G4-3NXBU000 BUBBLERS

No PMs for G4-3NXBU000

G4-3NXEL000 NORTH ELEVATOR

No PMs for G4-3NXEL000

G4-3NXELS00 SOUTH ELEVATOR

No PMs for G4-3NXELS00

G4-3NXFS000 FIRE SYSTEMS

48 G4-3NMDWM WATER: DECK WASH - Mechanics G4-3MECH 1 YEARS
Next 4/1/13 Next Job G4-3NMDWM- Use Target Start: Y

G4-3NMDWM-A	WATER : DECK WASH - ANNUAL		1
	10	SAFE CLEARANCE: NAVIGATION LOCK	
	20	INSPECT ALL PIPING & VALVING FOR LEAKS IN THE	
	30	CHECK ALL PIPE HANGERS MOUNTING BOLTS, TIGHTEN	
	40	CHECK FIRE HOSE & PIPE STANDARDS	

50 G4-3NXFSFP7E FIRE PROTECTION: FIRE PUMPS #7 - Electricians G4-3ELECT 6 MONTHS
Next 11/1/12 Next Job G4-3NXFSP7E Use Target Start: Y

G4-3NXFSP7E-A	FIRE PROTECTION: FIRE PUMPS Semi Annual		2
	10	SAFE CLEARANCE OR SWITCHER NAVIGATION LOCK	
	20	PUMP:FIRE PROTECTION	
G4-3NXFSP7E-S	FIRE PROTECTION: FIRE PUMPS Semi Annual		1
	10	SAFE CLEARANCE NAVIGATION LOCK	
	20	PUMP: FIRE PROTECTION	

51 G4-3NXFSFP7M FIRE PROTECTION: FIRE PUMPS #7 - Mechanics G4-3MECH 6 MONTHS
Next 10/20/12 Next Job G4-3NXFSP6M Use Target Start: Y

G4-3NXFSP6M-A	FIRE PROTECTION: FIRE PUMPS Annual		2
	10	RECORD TIME FOR ADMINISTRATIVE FUNCTIONS (AHA HECP, CLEARENACE E	
	15	MEGGAR MOTOR	
	20	CHECK WATER SYSTEM:	
	30	PUMP: FIRE PROTECTION	
	40	FIRE HOSE AND PIPE STANDARDS	
	50	OPEN VALVES TEST HOSE	
	60	CHECK MOTOR RUNNING CURRNET	
G4-3NXFSP6M-S	FIRE PROTECTION: FIRE PUMPS - S -		1
	10	SAFE CLEARANCE NAVIGATION LOCK	
	20	PUMP: #6 & #7 FIRE PROTECTION	

52 G4-3NXFSFPE FIRE PROTECTION: FIRE PUMPS #6 - Electricians G4-3ELECT 6 MONTHS
Next 9/1/12 Next Job G4-3NXFSP7E Use Target Start: Y

G4-3NXFSP7E-A	FIRE PROTECTION: FIRE PUMPS Semi Annual		2
	10	SAFE CLEARANCE OR SWITCHER NAVIGATION LOCK	
	20	PUMP:FIRE PROTECTION	
G4-3NXFSP7E-S	FIRE PROTECTION: FIRE PUMPS Semi Annual		1
	10	SAFE CLEARANCE NAVIGATION LOCK	
	20	PUMP: FIRE PROTECTION	

53 G4-3NXFSFPM FIRE PROTECTION: FIRE PUMPS #6 - Mechanics G4-3MECH 6 MONTHS
Next 10/4/12 Next Job G4-3NXFSP6M Use Target Start: Y

G4-3NXFSP6M-A	FIRE PROTECTION: FIRE PUMPS Annual		2
	10	RECORD TIME FOR ADMINISTRATIVE FUNCTIONS (AHA HECP, CLEARENACE E	
	15	MEGGAR MOTOR	
	20	CHECK WATER SYSTEM:	
	30	PUMP: FIRE PROTECTION	
	40	FIRE HOSE AND PIPE STANDARDS	
	50	OPEN VALVES TEST HOSE	
	60	CHECK MOTOR RUNNING CURRNET	
G4-3NXFSP6M-S	FIRE PROTECTION: FIRE PUMPS - S -		1
	10	SAFE CLEARANCE NAVIGATION LOCK	
	20	PUMP: #6 & #7 FIRE PROTECTION	

54	G4-3NXFSM	FIRE HOSE CABINET - Mechanics			G4-3MECH	6	MONTHS
	Next D t	7/1/12	Next Job Pl	G4-3NXFSM-A	Use Target Start:	Y	
	G4-3NXFSM-3	FIRE HOSE CABINET- (3 Y)				6	
		5	NAVIGATION LOCK:				
		10	INSPECT NOZZLES, HOSE, AND PLUG WRENCH AND CABINET				
		20	INSPECT HOSES AND PRESSURE TEST				
		30	CHECK PIPING FOR LEAKS				
		40	CLEAN UP AREA AND INSIDE OF CABINET				
		50	PAINT CABINET				
	G4-3NXFSM-A	FIRE HOSE CABINET- (A)				2	
		5	NAVIGATION LOCK:				
		10	INSPECT NOZZLES, HOSE AND CABINET				
		20	INSPECT HOSES AND PRESSURE TEST				
		30	CHECK PIPING FOR LEAKS				
		40	CLEAN UP AREA AND INSIDE OF CABINET				
	G4-3NXFSM-S	FIRE HOSE CABINET				1	
		5	NAVIGATION LOCK:				
		10	INSPECT NOZZLES, HOSE AND CABINET				

End of Asset G4-3NXFS000

G4-3NXFSP10 FIRE PUMP #1

No PMs for G4-3NXFSP10

G4-3NXFSP20 FIRE PUMP #2

No PMs for G4-3NXFSP20

This report pulls all Asset records in Operating status for the Site ID and USACE Org Code specified in the parameters along with all active Preventative Maintenance records (schedules) linked to the Assets and their related Job Plans.

The Frequency and Unit fields indicate how often the PM schedule runs. Sequence indicates which Job Plan will be used every *n* times the PM runs. For further explanation, see your Site or District FEM POC, or consult the FEM PM Guide on the FEM SharePoint site.

Database fields used (Table.Field):
ASSET.ASSETNUM, ASSET.DESCRIPTION, PM.PMNUM, PM.DESCRIPTION, PM.FREQUENCY, PM.FREQUNIT, PM.CREWID, PM.NEXTDATE, PM.EXTDATE, PM.JPNUM, PM.USETARGETDATE, PMMETER.METERNAME, PMMETER.FREQUENCY, PMSEQUENCE.JPNUM, PMSEQUENCE.INTERVAL, JOBPLAN.DESCRIPTION

D.3. New Cumberland Lock and Dam

PM & Jobplan Listing by Asset w/tasks

See the last page for field explanations
District: LRP

ASSET
PM
JOB PLAN

CREW
SEQUENCE

FREQUENCY

Pittsburgh , Ops Division Site -- Location: **LRPO-LON-L - New**

H4LONL **LON Lock**

1 H4LON%9970 Greasing Rack & Sector Gears MPG2-Q H4LON-MC 3 MONTHS
Next 10/3/12 Next Job Plan: H4LON30366 Use Target Y
H4LON30366 Greasing Rack and Sector Gears with MPG2 1
10 See Long Discription
1. Grease all teeth on Rack and Sector gears
2. Inspect all teeth and Machinery for wear

2 H4LON7762 Hydraulic Pumps-M 1 MONTHS
Next 7/25/12 Next Job Plan: H4LON24242 Use Target Y
H4LON24242 Hydraulic Pumps -M 1
10 see long description
1. Inspect mounting bolts, all piping and valves adjacent to pump.
2. Observe operation of pump and motor during lockage.
3. Inspect for oil leaks.

3 H4LON7823 Floating Mooring Pins 600'-SA H4LON-MC 6 MONTHS
Next 9/9/12 Next Job Plan: H4LON24363 Use Target Y
H4LON24363 Floating Mooring Pins 1
10 see long description
Inspect mooring bitt to see that no binding is occurring in the moving parts
Under load. No lubrication is needed.

One mooring bitt will be dewatered and inspected for corrosion or pitting on the exterior. The magnesium anodes will be inspected for deterioration. If corrosion or pitting is found dewatered two more bitts and inspect. If further defects are found, inspect all bitts in chamber. Otherwise a different bitt will be inspected each time. Bitts are counted from upstream to downstream.

1. 130.1 (Land Wall)
2. 130.2
3. 130.3
4. 130.4
5. 130.5
6. 130.6

7. 131.1 (Middle Wall)
8. 131.2
9. 131.3
10. 131.4
11. 131.5
12. 131.6

4 H4LON8465 Operating Levers, Rollers & Guides-Q H4LON-MC 3 MONTHS
Next 10/2/12 Next Job Plan: H4LON25323 Use Target Y
H4LON25323 Rack and Sector Gears, Operating Levers, Anchorage, Rollers and 1
10 see long description
1200' and 600' Chamber Miter Gates

Quarterly

1. Inspect and Lubricate Rollers and Guides with 630AA.

2. Inspect and Lubricate Rack and Sector Gears with MPG 2.
3. Inspect and Lubricate Operating Levers and Linkage Assemblies with MPG 2.
4. Visually check Anchorage for cracks and overall condition.
5. Check for looseness, wear and proper operation

End of Asset H4LONL

H4LONL01 LON Lock, Primary Lock Chamber 01

5 H4LON10018 Grease Inspection 1200' Lock Machinery-BW H4LON-MC 2 WEEKS
Next 7/25/12 Next Job Plan: H4LON32887 Use Target Y
H4LON32887 Greasing Inspection 1200' Lock Chamber 1

10 See long discription
Inspect the lock gate gudgeon pins, pintle bearings, roller pins & guides, sector gear bearings & arm bushings and pins with 630AA. Carefully inspect all bearings, rollers, guides and moving parts for wear and looseness. Inspect all pin keeper plates for looseness. Inspect for broken bolts or movement; lubricate, lock operating levers and linkage assembly. Inspect and swab the sector gears and racks. Inspect condition of oak bumping blocks.

1. Upper lock gates ' Inspect and lubricate gate operating machinery.
2. Lower lock gates ' Inspect and lubricate gate operating machinery.
3. Upper lock gates ' Inspect and lubricate linkage assembly, sector gears and rack. Inspect linkage for loose pins.
4. Lower lock gates ' Inspect and lubricate linkage assembly, sector gears and rack. Inspect linkage for loose pins.
5. Bumping Blocks ' Inspect and replace if needed.
6. Upper lock gates ' Inspect and lubricate hydraulic cylinder and stem. Inspect packing for leaks and adjust as needed.
7. Lower lock gates ' Inspect and lubricate hydraulic cylinder and stem. Inspect packing for leaks and adjust as needed.
8. Upper lock gates ' Check and adjust timing of upper gates.
9. Lower lock gates ' Check and adjust timing of lower gates.
10. Upper lock gates ' Inspect and lubricate flexible hydraulic line coupling.
11. Lower lock gates ' Inspect and lubricate flexible hydraulic line coupling.
12. All lock gates ' Clean up all excess grease and grease fittings.

6 H4LON7553 Greasing 1200' Lock Machinery-BW H4LON-MC 2 WEEKS
Next 7/17/12 Next Job Plan: H4LON23747 Use Target Y
H4LON23747 Greasing 1200 ft. Lock Chamber 1

10 1. Upper lock gates Inspect and lubricate gate operating machinery.
20 2. Lower lock gates Inspect and lubricate gate operating machinery.
30 3. Upper lock gates Inspect and lubricate linkage assembly, sector gears
40 4. Lower lock gates Inspect and lubricate linkage assembly, sector gears
50 5. Bumping Blocks Inspect and replace if needed.
60 6. Upper lock gates Inspect and lubricate hydraulic cylinder and stem.Inspect packing for leaks an
70 7. Lower lock gates ¿ Inspect and lubricate hydraulic cylinder and stem.
80 8. Upper lock gates Check and adjust timing of upper gates.
90 9. Lower lock gates ¿ Check and adjust timing of lower gates.
100 10. Upper lock gates Inspect and lubricate flexible hydraulic line coupling.
110 11. Lower lock gates Inspect and lubricate flexible hydraulic line coupling.
120 12. All lock gates Clean up all excess grease and grease fittings.

7 H4LON7846 Latching Devices-SA H4LON-MC 6 MONTHS
Next 9/22/12 Next Job Plan: H4LON24416 Use Target Y
H4LON24416 Latching Devices 1

10 see long description
Operate latching devices and steamboat ratchets for freeness of operation and lubricate as needed.

1. Upstream 600ft land wall gate.
2. Upstream 600ft middle wall gate.
3. Downstream 600ft land wall gate.
4. Downstream 600ft middle wall gate.

5. Upstream 1200ft river wall gate.
6. Upstream 1200ft middle wall gate.
7. Downstream 1200ft river wall gate.
8. Downstream 1200ft middle wall gate.

End of Asset H4LONL01

H4LONL01G LON Lock, Primary Lock Chamber Gates

No PMs for H4LONL01G

H4LONL01GM LON Lock, Primary Lock Chamber Gates, Miter

No PMs for H4LONL01GM

H4LONL01GMD LON Lock, Gates, Miter, Downstream, Primary Chamber

No PMs for H4LONL01GMD

H4LONL01GMD LON Lock, Gates, Operating Equip & Mach, Downstream, Primary Chamber

No PMs for H4LONL01GMDM

H4LONL01GMU LON Lock, Gates, Miter, Upstream, Primary Chamber

No PMs for H4LONL01GMU

H4LONL01GMU LON Lock, Gates, Operating Equip & Mach, Upstream, Primary Chamber

No PMs for H4LONL01GMUM

H4LONL01GOB LON Lock, Gates, Air Bubbler System, Primary Chamber

No PMs for H4LONL01GOB

H4LONL01GOM LON Lock, Gates, Embedded Metals, Primary Chamber

No PMs for H4LONL01GOM

H4LONL01GOS LON Lock, Gates, Seals, Primary Chamber

No PMs for H4LONL01GOS

H4LONL01GPD LON Lock, Gates, Storm Protection, Downstream, Primary Chamber

No PMs for H4LONL01GPD

H4LONL01GPU LON Lock, Gates, Storm Protection, Upstream, Primary Chamber

No PMs for H4LONL01GPU

H4LONL01S LON Lock, Primary Lock Chamber Structure

No PMs for H4LONL01S

H4LONL01SB LON Lock, Navigation Aides, Floating Mooring Bits, Primary Chamber

8 H4LON7835 Floating Mooring Pins 1200'-SA H4LON-MC 6 MONTHS
Next 9/8/12 Next Job Plan: H4LON24410 Use Target Y
H4LON24410 Floating mooring pins 1200 chamber 1
10 see long description
Inspect mooring bitt to see that no binding is occurring in the moving parts
Under load. No lubrication is needed.

One mooring bitt will be dewatered and inspected for corrosion or pitting on the exterior. The magnesium anodes will be inspected for deterioration. If corrosion or pitting is found dewatered two more bitts and inspect. If further defects are found, inspect all bitts in chamber. Otherwise a different bitt will be inspected each time. Bitts are counted from upstream to downstream.

1. 132.1 (Middle Wall)
2. 132.2
3. 132.3
4. 132.4

5. 133.1 (River Wall)
6. 133.2

7. 133.3
8. 133.4
9. 133.5
10. 133.6
11. 133.7
12. 133.8

End of Asset H4LONL01SB

H4LONL01SED LON Lock, Erosion Protection, Downstream Approach, Primary Chamber

No PMs for H4LONL01SED

H4LONL01SEU LON Lock, Erosion Protection, Upstream Approach, Primary Chamber

No PMs for H4LONL01SEU

H4LONL01SF LON Lock, Floor System, Primary Chamber

No PMs for H4LONL01SF

H4LONL01SGD LON Lock, Guard Sill, Downstream, Primary Chamber

No PMs for H4LONL01SGD

H4LONL01SGU LON Lock, Guard Sill, Upstream, Primary Chamber

No PMs for H4LONL01SGU

H4LONL01SMD LON Lock, Miter Sill, Downstream, Primary Chamber

No PMs for H4LONL01SMD

H4LONL01SMU LON Lock, Miter Sill, Upstream, Primary Chamber

No PMs for H4LONL01SMU

H4LONL01T LON Lock, Structures, Navigation Aides, Tow Haulage Systems, Primary Chaml

No PMs for H4LONL01T

H4LONL02 LON Lock, Auxiliary Lock Chamber 02

9 H4LON10020 Grease Inspection 600' Lock Machinery-BW H4LON-MC 2 WEEKS
Next 7/25/12 Next Job Plan: H4LON32895 Use Target Y
H4LON32895 Greasing Inspection 600' Lock Chamber-BW 1

10 See long discription
Inspect the lock gate gudgeon pins, pintle bearings, roller pins & guides, sector gear bearings & arm bushings and pins with 630AA. Carefully inspect all bearings, rollers, guides and moving parts for wear and looseness. Inspect all pin keeper plates for looseness. Inspect for broken bolts or movement; lubricate, lock operating levers and linkage assembly. Inspect and swab the sector gears and racks. Inspect condition of oak bumping blocks.

1. Upper lock gates ' Inspect and lubricate gate operating machinery.
2. Lower lock gates ' Inspect and lubricate gate operating machinery.
3. Upper lock gates ' Inspect and lubricate linkage assembly, sector gears and rack. Inspect linkage for loose pins.
4. Lower lock gates ' Inspect and lubricate linkage assembly, sector gears and rack. Inspect linkage for loose pins.
5. Bumping Blocks ' Inspect and replace if needed.
6. Upper lock gates ' Inspect and lubricate hydraulic cylinder and stem. Inspect packing for leaks and adjust as needed.
7. Lower lock gates ' Inspect and lubricate hydraulic cylinder and stem. Inspect packing for leaks and adjust as needed.
8. Upper lock gates ' Check and adjust timing of upper gates.
9. Lower lock gates ' Check and adjust timing of lower gates.
10. Upper lock gates ' Inspect and lubricate flexible hydraulic line coupling.
11. Lower lock gates ' Inspect and lubricate flexible hydraulic line coupling.
12. All lock gates ' Clean up all excess grease and grease fittings.

10 H4LON7552 Greasing 600' Lock Machinery-BW H4LON-MC 2 WEEKS
Next 7/17/12 Next Job Plan: H4LON23745 Use Target Y

H4LON23745 Greasing 600 ft. Lock Chamber 1

10 See Long Description for work needing done
Lubricate the lock gate gudgeon pins, pintle bearings, roller pins & guides, sector gear bearings & arm bushings and pins with 630AA. Carefully inspect all bearings, rollers, guides and moving parts for wear and looseness. Inspect all pin keeper plates for looseness. Inspect for broken bolts or movement; lubricate, lock operating levers and linkage assembly. Inspect and swab the sector gears and racks. Inspect condition of oak bumping blocks.

1. Upper lock gates ' Inspect and lubricate gate operating machinery.
2. Lower lock gates ' Inspect and lubricate gate operating machinery.
3. Upper lock gates ' Inspect and lubricate linkage assembly, sector gears and rack. Inspect linkage for loose pins.
4. Lower lock gates ' Inspect and lubricate linkage assembly, sector gears and rack. Inspect linkage for loose pins.
5. Bumping Blocks ' Inspect and replace if needed.
6. Upper lock gates ' Inspect and lubricate hydraulic cylinder and stem. Inspect packing for leaks and adjust as needed.
7. Lower lock gates ' Inspect and lubricate hydraulic cylinder and stem. Inspect packing for leaks and adjust as needed.
8. Upper lock gates ' Check and adjust timing of upper gates.
9. Lower lock gates ' Check and adjust timing of lower gates.
10. Upper lock gates ' Inspect and lubricate flexible hydraulic line coupling.
11. Lower lock gates ' Inspect and lubricate flexible hydraulic line coupling.
12. All lock gates ' Clean up all excess grease and grease fittings.

End of Asset H4LONL02

H4LONL02G LON Lock, Auxiliary Lock Chamber Gates

No PMs for H4LONL02G

H4LONL02GM LON Lock, Auxiliary Lock Chamber Gates, Miter

No PMs for H4LONL02GM

H4LONL02GMD LON Lock, Gates, Miter, Downstream, Auxiliary Chamber

No PMs for H4LONL02GMD

H4LONL02GMD LON Lock, Gates, Operating Equip & Mach, Downstream, Auxiliary Chamber

No PMs for H4LONL02GMDM

H4LONL02GMU LON Lock, Gates, Miter, Upstream, Auxiliary Chamber

No PMs for H4LONL02GMU

H4LONL02GMU LON Lock, Gates, Operating Equip & Mach, Upstream, Auxiliary Chamber

No PMs for H4LONL02GMUM

H4LONL02GOB LON Lock, Gates, Air Bubbler System, Auxiliary Chamber

No PMs for H4LONL02GOB

H4LONL02GOM LON Lock, Gates, Embedded Metals, Auxiliary Chamber

No PMs for H4LONL02GOM

H4LONL02GOS LON Lock, Gates, Seals, Auxiliary Chamber

No PMs for H4LONL02GOS

H4LONL02GPD LON Lock, Gates, Storm Protection, Downstream, Auxiliary Chamber

No PMs for H4LONL02GPD

H4LONL02GPU LON Lock, Gates, Storm Protection, Upstream, Auxiliary Chamber

No PMs for H4LONL02GPU

H4LONL02S LON Lock, Auxiliary Lock Chamber Structure

No PMs for H4LONL02S

H4LONL02SB LON Lock, Navigation Aides, Floating Mooring Bits, Auxiliary Chamber

No PMs for H4LONL02SB

H4LONL02SED LON Lock, Erosion Protection, Downstream Approach, Auxiliary Chamber

No PMs for H4LONL02SED

H4LONL02SEU LON Lock, Erosion Protection, Upstream Approach, Auxiliary Chamber

No PMs for H4LONL02SEU

H4LONL02SF LON Lock, Floor System, Auxiliary Chamber

No PMs for H4LONL02SF

H4LONL02SGD LON Lock, Guard Sill, Downstream, Auxiliary Chamber

No PMs for H4LONL02SGD

H4LONL02SGU LON Lock, Guard Sill, Upstream, Auxiliary Chamber

No PMs for H4LONL02SGU

H4LONL02SMD LON Lock, Miter Sill, Downstream, Auxiliary Chamber

No PMs for H4LONL02SMD

H4LONL02SMU LON Lock, Miter Sill, Upstream, Auxiliary Chamber

No PMs for H4LONL02SMU

H4LONLC LON Lock, Cranes

No PMs for H4LONLC

H4LONLCA LON Lock, Crane, Auxiliary

No PMs for H4LONLCA

H4LONLCAC LON Lock, Crane, Auxiliary, Power And Controls

No PMs for H4LONLCAC

H4LONLCAM LON Lock, Crane, Auxiliary, Motors And Machinery

No PMs for H4LONLCAM

H4LONLCAS LON Lock, Crane, Auxiliary, Structure

No PMs for H4LONLCAS

H4LONLCP LON Lock, Crane, Primary

No PMs for H4LONLCP

H4LONLCPC LON Lock, Crane, Primary, Power And Controls

No PMs for H4LONLCPC

H4LONLCPM LON Lock, Crane, Primary, Motors And Machinery

No PMs for H4LONLCPM

H4LONLCPS LON Lock, Crane, Primary, Structure

No PMs for H4LONLCPS

H4LONLI LON Lock, Instrumentation

11 H4LON7568 Water Log Digital Gage Readers-W H4LON-MC 1 WEEKS
Next 7/18/12 Next Job Plan: H4LON23938 Use Target Y
H4LON23938 Water Log Digital Gage Readers 1
10 See long discription for work needing done
1. Check for proper operation, accuracy and visual inspection of componets
2. Power sources
3. Calibrate if needed

End of Asset H4LONLI

H4LONLID LON Lock, Instrumentation, Data Management Systems

No PMs for H4LONLID

H4LONLIDC LON Lock, Instrumentation, Communication & Warning Systems

12 H4LON7695 Radios, Receiving & Transmitting Equipment-M H4LON-MC 1 MONTHS
Next 8/2/12 Next Job Plan: H4LON24085 Use Target Y
H4LON24085 Radios, Receiving and Transmitting Equipment 1

10 see long description
1. Check unit for proper operation on both transmit and receive.
2. Put on charge when required.
3. Report to Lockmaster any discrepancies, including light bulbs, damaged antennas, disruption to the operation or any other malfunction.
4. Once a month radios not used for an extended period of time will be removed from storage and turned on and left in the receive mode for several hours. The following day the radio will be charged for a period of 4 to 8 hours.

End of Asset H4LONLIDC

H4LONLIL LON Lock, Instrumentation, Data Loggers

No PMs for H4LONLIL

H4LONLIM LON Lock, Instrumentation, Alignment Monuments

No PMs for H4LONLIM

H4LONLIP LON Lock, Instrumentation, Piezometers

13 H4LON7859 Piezometers-SA H4LON-MC 6 MONTHS
Next 10/26/12 Next Job Plan: H4LON24422 Use Target Y
H4LON24422 piezometer 1

10 see long description
The readings should be recorded with date, time, upper gauge, lower gauge and lock chamber(600ft) level. Numbered from upstream to downstream.

1. Reading of #1 piezometer and record.
2. Reading of #2 piezometer and record.
3. Reading of #3 piezometer and record.

End of Asset H4LONLIP

H4LONLM LON Lock, Miscellaneous Systems

14 H4LON7760 Disk Springs-M H4LON-MC 1 MONTHS
Next 7/13/12 Next Job Plan: H4LON24250 Use Target Y
H4LON24250 Disk Springs 1

10 See long description
1. Inspect and lubricate upstream 600ft gates.
2. Inspect and lubricate downstream 600ft gates.
3. Inspect and lubricate upstream 1200ft gates.
4. Inspect and lubricate downstream 1200ft gates.
5. Check, measure and record drifting on upstream 600ft gates.
6. Check, measure and record drifting on downstream 600ft gates.
7. Check, measure and record drifting on upstream 1200ft gates.
8. Check, measure and record drifting on downstream 1200ft gates.

End of Asset H4LONLM

H4LONLME LON Lock, Miscellaneous Systems, Elevator

No PMs for H4LONLME

H4LONLMEC LON Lock, Miscellaneous Systems, Elevator, Cars And Equipment

15 H4LON10450 Elevator Assembly-TA H4LON-MC 3 YEARS
Next 12/16/12 Next Job Plan: H4LON35243 Use Target Y
H4LON35243 Elevator-TA 1

10 see long description
Inspected and Certified by Licensed Contractor.

16 H4LON10464 Elevator-A H4LON-MC 1 YEARS
Next 12/2/12 Next Job Plan: H4LON35988 Use Target Y

H4LON35988 Elevator-A 1

10 Elevator-A
Annual NO-LOAD Inspection to be performed by certified Inspector. Required by state of Ohio.

End of Asset H4LONLMEC

H4LONLMEM LON Lock, Other Structures, Elevator Tower, Penthouse/Machinery Room

No PMs for H4LONLMEM

H4LONLMEP LON Lock, Miscellaneous Systems, Elevator, Power And Controls

No PMs for H4LONLMEP

H4LONLMER LON Lock, Elevator Tower, Roof

No PMs for H4LONLMER

H4LONLMES LON Lock, Elevator Tower, Structure And Foundation

No PMs for H4LONLMES

H4LONLMESP LON Lock, Elevator Tower, Pit

No PMs for H4LONLMESP

H4LONLS LON Lock, Structures

No PMs for H4LONLS

H4LONLSE LON Lock, Structures, Embankments

No PMs for H4LONLSE

H4LONLSED LON Lock, Structures, Embankments, Downstream Approach

No PMs for H4LONLSED

H4LONLSEE LON Lock, Structures, Embankments, Landward Of Esplanade

No PMs for H4LONLSEE

H4LONLSEP LON Lock, Structures, Erosion Protection

No PMs for H4LONLSEP

H4LONLSEPDL LON Lock, Structures, Erosion Protection, Downstream, Landside Embankmen

No PMs for H4LONLSEPDLE

H4LONLSEU LON Lock, Structures, Embankments, Upstream Approach

No PMs for H4LONLSEU

H4LONLSO LON Lock, Structures, Other Structural Systems

No PMs for H4LONLSO

H4LONLSOB LON Lock, Bridges

No PMs for H4LONLSOB

H4LONLSOBFD LON Lock, Footbridge, Deck & Miscellaneous

No PMs for H4LONLSOBFD

H4LONLSOBFP LON Lock, Footbridge, Piers, Supports & Foundations

No PMs for H4LONLSOBFP

H4LONLSOBFS LON Lock, Footbridge, Superstructure

No PMs for H4LONLSOBFS

H4LONLSOBS LON Lock, Service Bridge, Deck & Miscellaneous

No PMs for H4LONLSOBS

H4LONLSOBSP LON Lock, Service Bridge, Piers, Supports & Foundations

No PMs for H4LONLSOBSP

H4LONLSOBSS LON Lock, Service Bridge, Superstructure

No PMs for H4LONLSOBSS

H4LONLSOCB LON Lock, Control Buildings

No PMs for H4LONLSOCB

H4LONLSOCBL LON Lock, Other Structures, Control Buildings, Land Wall

17 H4LON7551 John Deere Tractor-W H4LON-MC 1 WEEKS
Next 7/18/12 Next Job Plan: H4LON23737 Use Target Y
H4LON23737 John Deere Tractor 1

10 See Long Description
1. Check engine oil level, check gas level, check tire pressure and operated.
2. After first 20 hours of operation ' check and tighten wheel bolts and loose hardware. Change engine oil and filter
3. After first 50 hours of operation ' check and tighten wheel bolts, change transmission oil and filter, change hydraulic oil filter and change engine oil only.
4. After first 100 hours of operation ' change engine oil and filter.
5. Every 50 hours ' check tire pressure, check transmission oil level, lubricate front wheel spindles and axle pivot, check and clean air cleaner element, and check and tighten wheel bolts.
6. Every 100 hours or annually ' check and tighten loose hardware, check battery electrolyte level, clean battery, check and clean air cleaner element, change engine oil only, and inspect spark plugs and check gap.
7. Every 200 hours or annually ' change engine oil and filter.
8. Every 200 hours or two years ' replace fuel filter.
9. Every 250 hours ' change transmission oil and filter, and change hydraulic oil filter.
10. Every 500 hours ' check engine idle speeds, check carburetor adjustment check and adjust valve clearance and check fuel lines.
11. Hour meter reading.

End of Asset H4LONLSOCBL

H4LONLSOCBM LON Lock, Control Building, Middle Wall

No PMs for H4LONLSOCBM

H4LONLSOE LON Lock, Structures, Esplanade Paving System

No PMs for H4LONLSOE

H4LONLSOR LON Lock, Structures, Retaining Walls

No PMs for H4LONLSOR

H4LONLSOS LON Lock, Structures, Slope Paving System

No PMs for H4LONLSOS

H4LONLSW LON Lock, Structures, Lock Walls

18 H4LON7776 Wind Socks-M H4LON-MC 1 MONTHS
Next 8/11/12 Next Job Plan: H4LON24274 Use Target Y
H4LON24274 Wind Socks 1

10 see long description
1. Inspect for any defects.
2. Lubricate bearings.
3. Change as needed.

19 H4LON7795 Poly Overpack-Q H4LON-MC 3 MONTHS
Next 10/5/12 Next Job Plan: H4LON24305 Use Target Y
H4LON24305 poly overpack 1

10 poly overpack
Check the condition of the drum and its contents. Inventory contents.

1. Inspect drum.
2. 10 absorbent booms 6" X 18' long. Inspect and inventory.
3. 100 absorbent pads 18" X 18". Inspect and inventory.
4. 2 absorbent booms 3" X 10' long. Inspect and inventory.

5. 12 absorbent booms 2" X 4' long. Inspect and inventory.
6. 10 plastic bags. Inspect and inventory.
7. 3 Haz-Mat suits. Inspect and inventory.
8. 3 pair of inner gloves. Inspect and inventory.
9. 3 pair of silver shield outer gloves. Inspect and inventory.
10. 1 roll of duct tape. Inspect and inventory.

20 H4LON7913 Anchorage Assembly, Gudgeon Pin & Pintle Assembly-A H4LON-MC 1 YEARS
Next 4/26/13 Next Job Plan: H4LON24497 Use Target Y

H4LON24497 Anchorage Assembly, Gudgeon Pin & Pintle Assembly 1

10 see long description
Inspect anchorage assembly, gudgeon pin and pintle assembly; operate gate and check all above water parts for wear or looseness.
Check level of gates by placing machinist level on mitre end of gate and check during full travel of gate for level.

1. Upper 600ft land wall gate leaf.
2. Upper 600ft middle wall gate leaf.
3. Lower 600ft land wall gate leaf.
4. Lower 600ft middle wall gate leaf.
5. Upper 1200ft middle wall gate leaf.
6. Upper 1200ft river wall gate leaf.
7. Lower 1200ft middle wall gate leaf.
8. Lower 1200ft river wall gate leaf.

End of Asset H4LONLSW

H4LONLSWCD LON Lock, Structures, Cutoff Walls, Downstream

No PMs for H4LONLSWCD

H4LONLSWCU LON Lock, Structures, Cutoff Walls, Upstream

No PMs for H4LONLSWCU

H4LONLSWDD LON Lock, Structures, Lock Walls, Lower Guide Wall

No PMs for H4LONLSWDD

H4LONLSWDR LON Lock, Structures, Lock Walls, Lower Guard Wall

No PMs for H4LONLSWDR

H4LONLSWL LON Lock, Structures, Lock Walls, Land Wall

H4LON8083 Fall device to Sea Mule-Q H4LON-MC 3 MONTHS
Next 9/15/12 Next Job Plan: H4LON24845 Use Target Y

H4LON24845 Fall device to Sea Mule 1

10 Load test to 433lb every 4 years
20 Check Fall device for proper operation
30 Check Safety Harness

End of Asset H4LONLSWL

H4LONLSWM LON Lock, Structures, Lock Walls, Middle Wall

No PMs for H4LONLSWM

H4LONLSWR LON Lock, Structures, Lock Walls, River Wall

No PMs for H4LONLSWR

H4LONLSWUD LON Lock, Structures, Lock Walls, Upper Guide Wall

H4LON7934 Tainter Valve Bulkheads-TA H4LON-MC 3 YEARS
Next 7/5/13 Next Job Plan: H4LON24524 Use Target Y

H4LON24524 Tainter Valve Bulkheads 1

10 see long description
Tainter valve bulkheads should be inspected for rust and corrosion each year. Inspect flood gates for proper operation and grease. Check rubber seals for looseness, breaks or cracking. Clean and paint as needed.

1. #1 Bulkhead
2. #2 Bulkhead
3. #3 Bulkhead

4. #4 Bulkhead

End of Asset H4LONLSWUD

H4LONLSWUR LON Lock, Structures, Lock Walls, Upper Guard Wall

No PMs for H4LONLSWUR

H4LONLU LON Lock, Utility Systems

No PMs for H4LONLU

H4LONLUA LON Lock, Utility Systems, Air System

21 H4LON7575 Air Receivers-W H4LON-MC 1 WEEKS
Next 7/19/12 Next Job Plan: H4LON23940 Use Target Y
H4LON23940 Draining Air Receivers 1

10 See Long Discription for work needing done.
During hot months (April ' October) drain air receivers of moisture.

1. Air receiver at upper end of gallery.
2. Air receiver under the operations building.
3. Air receiver at lower end of gallery.

22 H4LON7577 Ingersoll Rand Air Compressor-W H4LON-MC 1 WEEKS
Next 7/18/12 Next Job Plan: H4LON23952 Use Target Y
H4LON23952 Ingersoll Rand Air Compressor 1

10 See long discription for work needing done
1-5 are checked daily and recorded weekly.

1. Inspect coolant level.
2. Inspect discharge temperature (Air)
3. Inspect separator element differential.
4. Inspect air filter Delta P (At Full Load).
5. Inspect oil filter Delta P.
6. Tighten fan blade bolts and motor bolts every three months.
7. Check temperature sensor ' 1000 hours.
8. Replace coolant filter ' 2000 hours or 6 months.
9. Clean separator scavenge screen and orifice ' 4000 hours or yearly.
10. Clean cooler cores and replace air filters ' 4000 hours or yearly.
11. Replace separator element (see special note on page 19)
12. Replace coolant ' 8000 hours or two years.
13. Inspect starter contactors ' 8000 hours or yearly.

End of Asset H4LONLUA

H4LONLUAC LON Lock, Utility Systems, Air System, Controls

No PMs for H4LONLUAC

H4LONLUAD LON Lock, Utility Systems, Air System, Distribution System

No PMs for H4LONLUAD

H4LONLUAP LON Lock, Utility Systems, Air System, Pumps, Valves & Receivers

23 H4LON7924 Air Receivers-BA H4LON-MC 2 YEARS
Next 10/14/13 Ext 8/1/13 Next Job Plan: H4LON24518 Use Target Y
H4LON24518 Air Receivers 1

10 see long description
Inspect air receivers for safe operating condition. Check safety valves for good operating condition and correct pressure. Repair and adjust as needed to provide good operation. This inspection will be made by district office inspector. Inspection certificate will be posted near receiver. Lockmaster will make annual inspection.

1. Air receiver in middle wall gallery at upper end.
2. Air receiver in gallery under operations building.

3. Air receiver in middle wall gallery at lower end.
4. Air receiver on bulkhead hoist.

End of Asset H4LONLUAP

H4LONLUE LON Lock, Utility Systems, Electrical Power & Controls

24 H4LON7582 Ground Fault Circuit Interrupters-M H4LON-MC 1 MONTHS
Next 7/15/12 Next Job Plan: H4LON23959 Use Target Y
H4LON23959 Ground Fault Circuit Interrupters 1

10 See long discription for work needing done
1. Inspect wire for broken areas.
2. Test GFI with push to teat button.
3. Use GFI tester for inspection

End of Asset H4LONLUE

H4LONLUEC LON Lock, Utility Systems, Electric Power & Control, Control Systems

No PMs for H4LONLUEC

H4LONLUED LON Lock, Utility Systems, Electric Power & Control, Distributon Systems

No PMs for H4LONLUED

H4LONLUEGM LON Lock, Utility Systems, Electric Power & Control, Switch Gear/Motor Contr

No PMs for H4LONLUEGM

H4LONLUEL LON Lock, Utility Systems, Electric Power & Control, Lighting Systems

No PMs for H4LONLUEL

H4LONLUEP LON Lock, Utility Systems, Electric Power & Control, Lightning Protection Syst

No PMs for H4LONLUEP

H4LONLUH LON Lock, Utility Systems, Hydraulic System

No PMs for H4LONLUH

H4LONLUHD LON Lock, Utility Systems, Hydraulic System, Distribution System

No PMs for H4LONLUHD

H4LONLUHPB LON Lock, Utility Systems, Hydraulic System, Pumps, Backup

H4LON7548 Hydraulic Holding Pump-W H4LON-MC 1 WEEKS
Next 7/18/12 Next Job Plan: H4LON23688 Use Target Y
H4LON23688 Holding Pump 1

10 Inspect mounting bolts and general operation
20 Lubricate in accordance with manufacturers recommendations
30 Keep on Line

End of Asset H4LONLUHPB

H4LONLUHPP LON Lock, Utility Systems, Hydraulic System, Pumps, Primary

25 H4LON7546-3 Hydraulic Pumps-W H4LON-MC 1 WEEKS
Next 7/18/12 Next Job Plan: H4LON23595-3 Use Target Y
H4LON23595-3 Hydraulic Pumps1,2.3 1

10 Inspect polarized electrical plug and wiring
Hydraulic Pump Motor

1. Inspect polarized electrical plug and wiring.
2. On Line.
3. Off Line.
4. Inspect the complete operation, if put on line, listen for unusual noises check the pressure should be 850lb, make sure the timing is correct and the motor is not coming on at the same time as another motor. If adjustments to the timing or pressure is needed make the necessary adjustments.

20 On Line
30 Inspect the complete operation, if put on line, listen for unusual noises check the pressure should

26 H4LON7863 Faulk couplings-SA H4LON-MC 6 MONTHS

Next 10/19/12 Next Job Plan: H4LON24433 Use Target Y

H4LON24433 faulk couplings 1

10 see long description
Faulk Couplings

Inspect, clean, and lubricate Faulk Coupling between hydraulic pumps and electric motors.

1. Hydraulic holding pump and electric motor.
2. #1 hydraulic oil pump and electric motor.
3. #2 hydraulic oil pump and electric motor.
4. #3 hydraulic oil pump and electric motor.

End of Asset H4LONLUHPP

H4LONLUHVC LON Lock, Utility Systems, Hydraulic System, Valves And Controls

27 H4LON7878 Filters, Strainers & Bypass Relief Valves-A H4LON-MC 1 YEARS

Next 3/22/13 Next Job Plan: H4LON24455 Use Target Y

H4LON24455 Filters, Strainers and Bypass Relief Valves 1

10 see long description
Each year it will be necessary to remove the oil filters in the return line of the hydraulic oil system from the housing and clean both the cartridges and the interior of the housing. Flush with fuel oil and clean with soft brush. Do not use abrasive material for cleaning. At the time the filters are dismantled, the basket-type strainer shall be removed and cleaned. It will not be necessary to stop lockage during the cleaning as each strainer or filter can be isolated from the hydraulic system.

The operation of the by-pass relief valve will be tested after the filters and strainers have been cleaned. The procedure will be to close the manual stop valve to one filter. With one pump operating, slowly close the manual valve on the discharge side of the other filter. Watch the pressure gauge on the inlet side of this filter. When the pressure on this gauge reaches 17 lbs., the relief valve is working properly. If the pressure continues to rise, adjust valve and retest.

1. Inspect and clean filters.
2. Inspect and clean strainers.
3. Inspect and test by-pass relief valves.

28 H4LON7908 Hydraulic Relief & Unloading Valves-A H4LON-MC 1 YEARS

Next 4/26/13 Next Job Plan: H4LON24490 Use Target Y

H4LON24490 Relief & Unloading Valve 1

10 see long description
Relief and Unloading Valves

Check setting of relief and unloading valves by operating each pump separately and noting the pressure gauge reading at which the pump unloads or the relief valve opens.

1. Unloading valve for #1 pump ' set at 850 lb.
2. Unloading valve for #2 pump ' set at 850 lb.
3. Unloading valve for #3 pump ' set at 850 lb.
4. Relief valve for holding pump ' set at 1,000 lb.

End of Asset H4LONLUHVC

H4LONLUSPW LON Lock, Utility Systems, Combined Service/Potable Water System

No PMs for H4LONLUSPW

H4LONLUSPWD LON Lock, Utility Systems, Combined Service/Potable Water System, Distributi

No PMs for H4LONLUSPWD

H4LONLUSW LON Lock, Utility Systems, Service Water (Only) System

No PMs for H4LONLUSW

H4LONLUSWP LON Lock, Utility Systems, Service Water (Only) System, Pumps & Controls

No PMs for H4LONLUSWP

H4LONLV LON Lock, Valves

29 H4LON10023 Grease Inspection Tainter Valves-BW H4LON-MC 2 WEEKS
Next 7/25/12 Next Job Plan: H4LON32903 Use Target Y
H4LON32903 Inspection of Tainter Valves 600 ft. and 1200 ft. Chamber- BW 1

10 See long Discription
Inspect tainter valve operating machinery including rocker base, crosshead gibs, upper strut pin, spring and trunnion bearings. Check all machinery for looseness and wear. Check for broken flexible grease lines. Check indicator rods and traveling nut limit switch rods for broken bolts or rod.

1. Inspect and lubricate operating machinery in land wall filling valve.
2. Inspect flexible grease lines and indicator rods in land wall filling valve.
3. Inspect and lubricate operating machinery in land wall emptying valve.
4. Inspect flexible grease lines and indicator rods in land wall emptying valve.
5. Inspect and lubricate operating machinery in middle wall filling valve.
6. Inspect flexible grease lines and indicator rods in middle wall filling valve.
7. Inspect and lubricate operating machinery in middle wall emptying valve.
8. Inspect flexible grease lines and indicator rods in middle wall emptying valve.
9. Inspect and lubricate operating machinery in river wall filling valve.
10. Inspect flexible grease lines and indicator rods in river wall filling valve.
11. Inspect and lubricate operating machinery in river wall emptying valve.
12. Inspect flexible grease lines and indicator rods in river wall emptying valve.
13. Clean all excess grease and fittings.

SR. Inspect and lubricate hydraulic cylinder and stem. Inspect packing for Leaks and adjust as needed.

End of Asset H4LONLV

H4LONLV01G LON Lock, Valves, Other Items, Debris Guards, Intakes, Primary Chamber

No PMs for H4LONLV01G

H4LONLV02G LON Lock, Valves, Other Items, Debris Guards, Intakes, Auxiliary Chamber

No PMs for H4LONLV02G

H4LONLVT LON Lock, Valves, Tainter

30 H4LON7554 Greasing Tainter Valves-BW H4LON-MC 2 WEEKS
Next 7/17/12 Next Job Plan: H4LON23751 Use Target Y
H4LON23751 Lubrication of Tainter Valves 600ft Chamber 1

10 See Long Description for work needing done
Lubricate tainter valve operating machinery including rocker base, crosshead gibs, upper strut pin, spring and trunnion bearings. Check all machinery for looseness and wear. Check for broken flexible grease lines. Check indicator rods and traveling nut limit switch rods for broken bolts or rod.

1. Inspect and lubricate operating machinery in land wall filling valve.
2. Inspect flexible grease lines and indicator rods in land wall filling valve.
3. Inspect and lubricate operating machinery in land wall emptying valve.
4. Inspect flexible grease lines and indicator rods in land wall emptying valve.
5. Inspect and lubricate operating machinery in middle wall filling valve.
6. Inspect flexible grease lines and indicator rods in middle wall filling valve.
7. Inspect and lubricate operating machinery in middle wall emptying valve.
8. Inspect flexible grease lines and indicator rods in middle wall emptying valve.
9. Inspect and lubricate operating machinery in river wall filling valve.
10. Inspect flexible grease lines and indicator rods in river wall filling valve.
11. Inspect and lubricate operating machinery in river wall emptying valve.
12. Inspect flexible grease lines and indicator rods in river wall emptying valve.

13. Clean all excess grease and fittings.
SR. Inspect and lubricate hydraulic cylinder and stem. Inspect packing for Leaks and adjust as needed.

31 H4LON7757 Valve Interlock System-M H4LON-MC 1 MONTHS
Next 8/11/12 Next Job Plan: H4LON24235 Use Target Y
H4LON24235 Valve Interlock System 1

10 see long description
1. Check physical condition of lights, switches and wiring.
2. Open upper 600 miter gates and try to operate all valves for that chamber.
3. Open lower 600 miter gates and try to operate all valves for that chamber.
4. Open upper 1200 miter gates and try to operate all valves for that chamber.
5. Open lower 1200 miter gates and try to operate all valves for that chamber.

End of Asset H4LONLVT

H4LONLVTEL LON Lock, Valves, Tainter, Emptying, Land Wall

No PMs for H4LONLVTEL

H4LONLVTELE LON Lock, Valves, Embedded Metals, Emptying Valves, Land Wall

No PMs for H4LONLVTELE

H4LONLVTELG LON Lock, Valves, Debris Guards, Emptying Valves, Land Wall

No PMs for H4LONLVTELG

H4LONLVTELM LON Lock, Valves, Operating Machinery, Emptying Valve, Land Wall

No PMs for H4LONLVTELM

H4LONLVTELS LON Lock, Valves, Seals, Emptying Valves, Land Wall

No PMs for H4LONLVTELS

H4LONLVTEM LON Lock, Valves, Tainter, Emptying, Middle Wall

No PMs for H4LONLVTEM

H4LONLVTEME LON Lock, Valves, Embedded Metals, Emptying Valves, Middle Wall

No PMs for H4LONLVTEME

H4LONLVTEMG LON Lock, Valves, Debris Guards, Emptying Valves, Middle Wall

No PMs for H4LONLVTEMG

H4LONLVTEMM LON Lock, Valves, Operating Machinery, Emptying Valve, Middle Wall

No PMs for H4LONLVTEMM

H4LONLVTEMS LON Lock, Valves, Seals, Emptying Valves, Middle Wall

No PMs for H4LONLVTEMS

H4LONLVTER LON Lock, Valves, Tainter, Emptying, River Wall

No PMs for H4LONLVTER

H4LONLVTERE LON Lock, Valves, Embedded Metals, Emptying Valves, River Wall

No PMs for H4LONLVTERE

H4LONLVTERG LON Lock, Valves, Debris Guards, Emptying Valves, River Wall

No PMs for H4LONLVTERG

H4LONLVTERM LON Lock, Valves, Operating Machinery, Emptying Valve, River Wall

No PMs for H4LONLVTERM

H4LONLVTERS LON Lock, Valves, Seals, Emptying Valves, River Wall

No PMs for H4LONLVTERS

H4LONLVTFL LON Lock, Valves, Tainter, Filling, Land Wall

No PMs for H4LONLVTFL

H4LONLVTFLE LON Lock, Valves, Embedded Metals, Filling Valves, Land Wall

No PMs for H4LONLVTFLE

H4LONLVTFLG LON Lock, Valves, Debris Guards, Filling Valves, Land Wall

No PMs for H4LONLVTFLG

H4LONLVTFLM LON Lock, Valves, Operating Machinery, Filling Valve, Land Wall

No PMs for H4LONLVTFLM

H4LONLVTFLS LON Lock, Valves, Seals, Filling Valves, Land Wall

No PMs for H4LONLVTFLS

H4LONLVTFM LON Lock, Valves, Tainter, Filling, Middle Wall

No PMs for H4LONLVTFM

H4LONLVTFME LON Lock, Valves, Embedded Metals, Filling Valves, Middle Wall

No PMs for H4LONLVTFME

H4LONLVTFMG LON Lock, Valves, Debris Guards, Filling Valves, Middle Wall

No PMs for H4LONLVTFMG

H4LONLVTFMM LON Lock, Valves, Operating Machinery, Filling Valve, Middle Wall

No PMs for H4LONLVTFMM

H4LONLVTFMS LON Lock, Valves, Seals, Filling Valves, Middle Wall

No PMs for H4LONLVTFMS

H4LONLVTFR LON Lock, Valves, Tainter, Filling, River Wall

32 H4LON10473 Reovate Riverwall filling Valve;Middle wall Filling Valve and Operating Machinery 0 YEARS

Next Next Job Plan: Use Target Y

End of Asset H4LONLVTFR

H4LONLVTFRE LON Lock, Valves, Embedded Metals, Filling Valves, River Wall

No PMs for H4LONLVTFRE

H4LONLVTFRG LON Lock, Valves, Debris Guards, Filling Valves, River Wall

No PMs for H4LONLVTFRG

H4LONLVTFRM LON Lock, Valves, Operating Machinery, Filling Valve, River Wall

No PMs for H4LONLVTFRM

H4LONLVTFRS LON Lock, Valves, Seals, Filling Valves, River Wall

No PMs for H4LONLVTFRS

H4LONLXE LON Lock, Closure Systems, Dual Purpose Maintenance/Emergency

No PMs for H4LONLXE

H4LONLXEB LON Lock, Closure Systems, Maintenance, Bulkheads

33 H4LON7902 Bulkhead Recess Filler Blocks, Turnbuckles and Anchors-A H4LON-MC 1 YEARS

Next 4/27/13 Next Job Plan: H4LON24472 Use Target Y

H4LON24472 Bulkhead Recess Filler Blocks, Turnbuckles and Anchors 1

10 see long description

Make detailed inspection and examine the bulkhead recess filler blocks after each use. If filler blocks are not to be used for considerable time, inspect at least once a year. Check to determine that filler blocks are firmly seated in the recesses and flush with the face of the lock walls. Lubricate turnbuckles, clevises, and pins, as required. Inspect for excessive corrosion or deterioration. Painting will be required when the protective coating is damaged or worn off.

1. Filler block at land wall pier.
2. Turnbuckle and anchor at land wall pier.
3. Filler block at middle wall pier Ohio side.

4. Turnbuckle and anchor at middle wall pier Ohio side.
5. Filler block at middle wall pier West Virginia side.
6. Turnbuckle and anchor at middle wall pier West Virginia side.
7. Filler block at river wall pier.
8. Turnbuckle and anchor at river wall pier.

End of Asset H4LONLXEB

H4LONLXEF LON Lock, Closure Systems, Maintenance, Lifting Frames

No PMs for H4LONLXEF

H4LONLXEH LON Lock, Closure Systems, Maintenance, Hoisting Equipment

No PMs for H4LONLXEH

This report pulls all Asset records in Operating status for the Site ID and USACE Org Code specified in the parameters along with all active Preventative Maintenance records (schedules) linked to the Assets and their related Job Plans.

The Frequency and Unit fields indicate how often the PM schedule runs. Sequence indicates which Job Plan will be used every ***n*** times the PM runs. For further explanation, see your Site or District FEM POC, or consult the FEM PM Guide on the FEM SharePoint site.

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14. ABSTRACT

The US Army Corps of Engineers (USACE) has constructed a wide vari-ety of civil works structures. Many of these structures have surpassed their design life and deteriorated to a point that better tools and more extensive analysis are needed to identify the most critical maintenance and repair (M&R) needs. The work documented in this report analyzes how data collected in Facility Equipment Maintenance (FEM) can be used to evaluate the effectiveness of maintenance to improve the condition of lock infrastructure components. This includes analyzing how data already being collected in FEM can be used to evaluate maintenance effectiveness and also what additional data could be collected. In the process of addressing these objectives, numerous limitations in how FEM and Operational Condition Assessment (OCA) could be used to address this question were discovered, and they are documented in this report. The report also discusses numerous ways FEM could be used more effectively to address this question and the general benefit of USACE. A pilot Maintenance Effectiveness Review (MER) was held at a USACE lock and dam project.

15. SUBJECT TERMS
Civil Works, Data Management, Facilities Equipment Maintenance (FEM), Asset Management (AM), Locks and Dams, Maintenance Effectiveness Review (MER), Navigation structures

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